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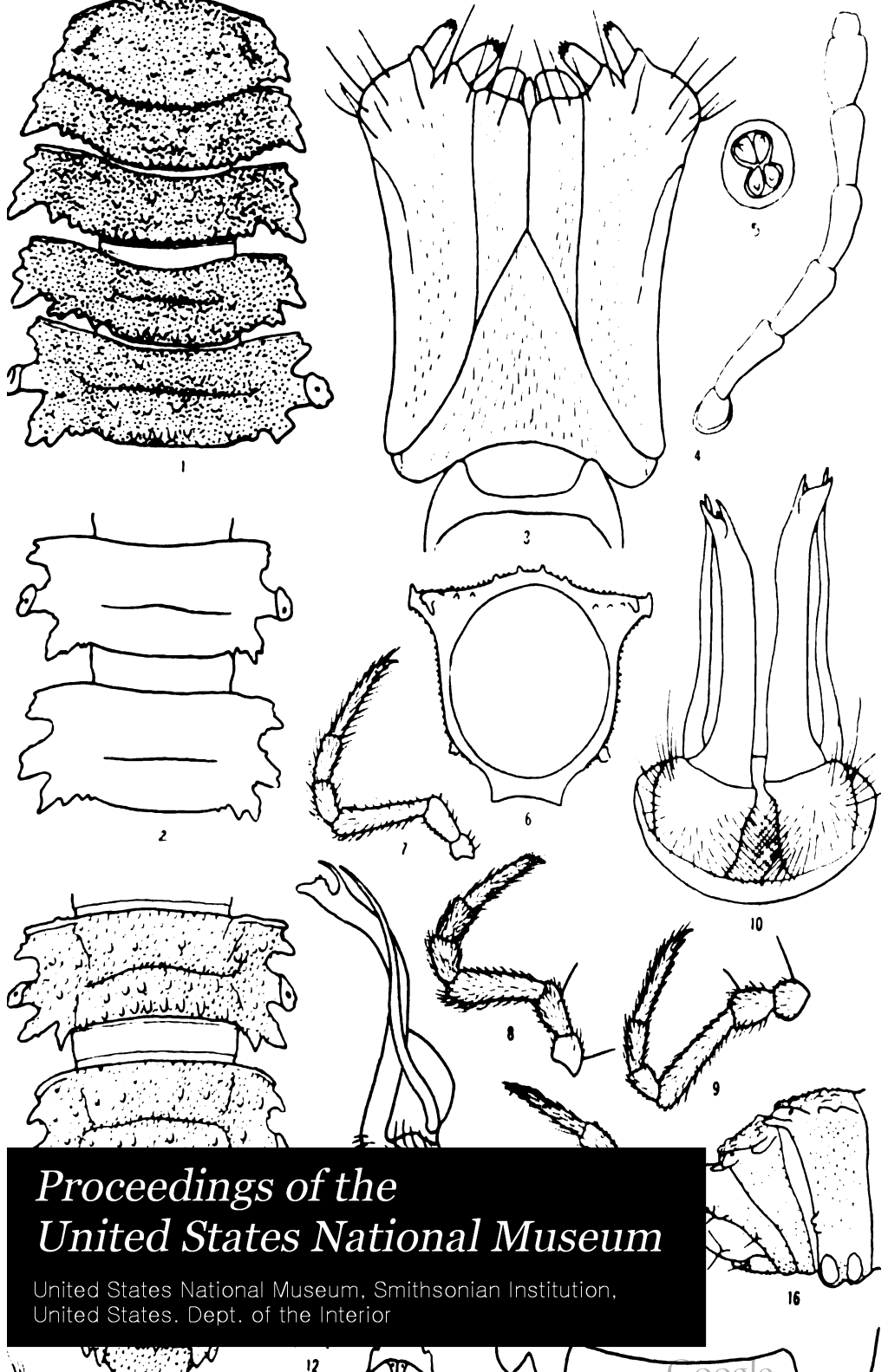

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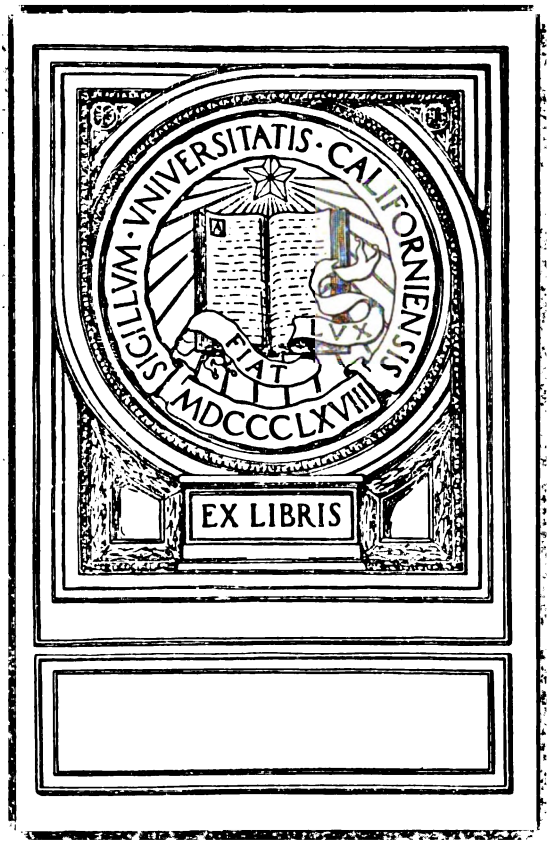

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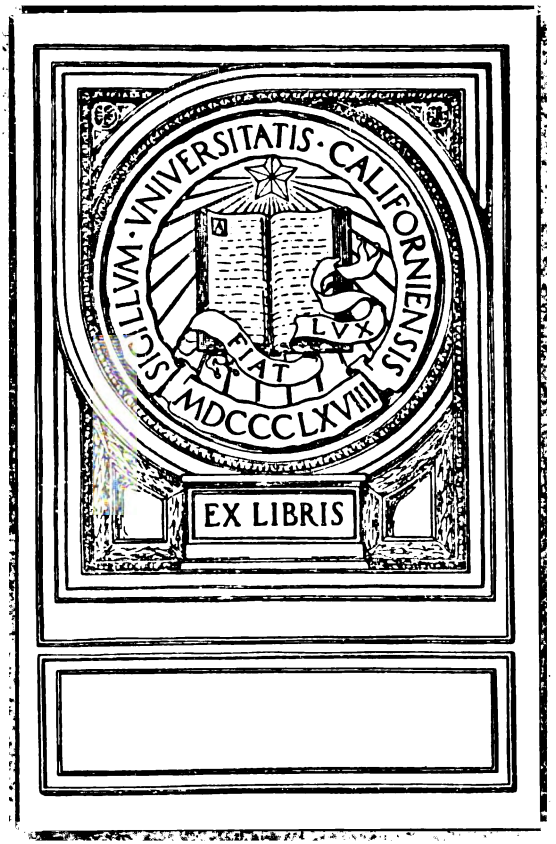

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The extension of the scope of the National Museum during recent years and the activity of the collectors employed in its interest have caused a great increase in the amount of material in its possession. Many of the objects gathered are of a novel and important character, and serve to throw a new light upon the study of nature and of man.

The importance to science of prompt publication of descriptions of this material led to the establishment, in 1878, of the present series of publications, entitled "Proceedings of the United States National Museum," the distinguishing peculiarity of which is that the articles are published in pamphlet form as fast as completed and in advance of the bound volume. The present volume constitutes the eighteenth of the series.

The articles in this series consist: First, of papers prepared by the scientific corps of the National Museum; secondly, of papers by others, founded upon the collections in the National Museum; and, finally, of facts and memoranda from the correspondence of the Smithsonian Institution.

The Bulletin of the National Museum, the publication of which was commenced in 1875, consists of elaborate papers based upon the collections of the Museum, reports of expeditions, etc., while the Proceedings facilitate the prompt publication of freshly-acquired facts relating to biology, anthropology and geology, descriptions of restricted groups of animals and plants, the discussion of particular questions relative to the synonymy of species, and the diaries of minor expeditions.

Other papers of more general popular interest are printed in the Appendix to the Annual Report.

Papers intended for publication in the Proceedings and Bulletin of the National Museum are referred to the Advisory Committee on Publications, composed as follows: Frederick W. True (chairman), Marcus Benjamin (editor), James E. Benedict, Otis T. Mason, Leonhard Stejneger, and Lester F. Ward.

S. P. LANGLEY,
Secretary of the Smithsonian Institution.

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LIST OF CORRECTIONS.

Page 119, erase first dash in *Alta-Mira Yellow-Throat.*

Page 779, for *Glossophaga villosa*, new species, read *Glossophaga truei*, new species.

[Since this description was prepared I have become acquainted with the fact that the name *Glossophaga villosa* was used in 1830 by Rengger (Naturgeschichte d. Säugeth. Paraguay, p. 30) for a species of bat, which, however, is not a member of the genus *Glossophaga* as now restricted. Wagner (Suppl. Schreber's Säugeth., p. 620) places Rengger's species under *Chœronycteris*, with which genus it agrees in possessing three premolars in both jaws. But in other respects the description is distinct from any form now known. H. Allen.]

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PROCEEDINGS

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DIAGNOSES OF NEW MOLLUSKS FROM THE SURVEY OF THE MEXICAN BOUNDARY.

By W. H. DALL,

Honorary Curator of the Department of Mollusks.

THE International Boundary Commission for the survey of the line between the United States and Mexico was accompanied by Dr. Edgar A. Mearns, U. S. A., who, with his associates, collected objects of natural history both along the line and from the ocean near its western terminus. A full report on the mollusks has been prepared by the writer, with suitable illustrations, but as this may be some time delayed in publication, waiting for the completion of other reports, the following diagnoses of new forms have been prepared.

Family HELICIDÆ.

PATULA STRIGOSA, Gould, var. CONCENTRATA, Dall.

Shell exactly mimicking the normal *P. strigosa*, with rounded whorls, but measuring only 13 mm. in minor and 16 mm. in major diameter, with a height of 8 mm.

Summits of the Hachita Grande and Huachuca Mountains, abundant.

EPIPHRAGMOPHORA ARIZONENSIS, new species.

Shell small, moderately elevated; light brown, with a narrow brown band just above the periphery, mostly concealed by the suture, but visible internally in the aperture on the outer side; whorls four and a half, of which one and a half are nepionic and punctate, the remainder with

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rather well-marked incremental lines and microscopic vermicular markings, of which the longer axes are subparallel to the lines of growth; suture distinct, whorls full and rounded, but with the periphery slightly above the middle, the last whorl descending a little near the aperture; base full and rounded; umbilicus narrow, deep; aperture expanded, the pillar lip reflected, but the outer lip not so. Height, 11; major diameter, 17; minor diameter, 13.5 mm.

Locality.—Banks of the Santa Cruz River, near Tucson, Arizona. Like *Arionta* var. *indioensis*, Yates, but smaller, with less oval aperture and narrower umbilicus. That species has the brown line not covered by the suture.

EPIPHRAGMOPHORA HACHITANA, new species.

Shell large, depressed, polished, sculptured with irregularly prominent, incremental lines, but without spiral striation or surface granulation; whorls four and a half, rounded; suture distinct; last whorl depressed near the peristome; aperture oblique, with a thickened and somewhat dilated but not reflected lip; pillar lip broad near the body; umbilicus moderate, deep, exhibiting nearly two whorls; the fresh shell livid waxen, or pale reddish-purple, with a single darker band, bordered by paler color, above the periphery. Major diameter, 26.5; minor diameter, 21; height, 12 mm.

Locality.—Hachita Grande Mountain, at an altitude of 8,270 feet, and in many other localities in the central region.

This resembles *E. magdalenensis*, Stearns, but is a much larger shell, and, when fresh, of a different color.

POLYGYRA CHIRICAHUANA, new species.

Depressed, thin and polished, dark brown, with five and a half whorls, and sculptured only with fine incremental lines; suture distinct, periphery rounded, with a constriction behind the peristome, which descends slightly; umbilicus deep, narrow; aperture oblique, with a narrow, livid, strongly reflected lip, which is somewhat flexuous and entirely destitute of internal teeth; body without teeth, the lips united by a thin smooth callus. Height, 7.7; major diameter, 18; minor diameter, 14.8 mm.

Locality.—Fly Park, Chiricahua Mountains, Arizona, at an elevation of 10,000 feet.

Like *P. levettei*, but larger and edentulous.

POLYGYRA MEARNSII, new species.

Shell pinkish-brown, depressed, five-whorled, sculptured only with fine lines of growth; spire much depressed, suture very distinct; periphery rounded, but above the middle of the whorl; base somewhat compressed, rounded; umbilicus deep and narrow; last whorl a little depressed and strongly constricted behind the peristome, which is

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oblique and strongly reflected, united over the body by a well-marked callus, on which are two converging but not united lamellæ; basal part of the peristome with two distinct transverse lamellæ, outer lip broader, receding with a single oblique tooth deeper in the aperture. Height, 5.5; major diameter, 13; minor diameter, 11 mm.

Locality.—Hachita Grande and Huachuca Mountains, New Mexico.

Distinguished from all other species by its three well-marked teeth on the outer lip.

Family PUPIDÆ.

Genus HOLOSPIRA, Martens.

Subgenus HOLOSPIRA ss.

Axis with a plait in the penultimate whorl and with basal, parietal, and peripheral lamellæ projecting into the lumen of that whorl.

Type, *H.pilocerei*, Pfeiffer. The subgenus includes also *H. goldfussii*, Pfeiffer, and *H. goniostoma*, Pfeiffer.

Section BOSTRICHOCENTRUM, Strebel and Pfeffer.

Axis moderate, with a continuous plait nearly the whole length but with no lamellæ.

Type, *H. tryoni*, Pfeiffer. *H. veracruzianus* also belongs here.

Section HAPLOSTEMMA, Dall.

Axis moderate, with a short, stout, axial lamella in the penultimate whorl only.

Type, *H. mearnsii*, Dall.

Section EUDISTEMMA, Dall.

Penultimate whorl with a short axial and a parietal lamella only. Axis moderate. Type, *H. arizonensis*, Stearns.

Section DISTOMOSPIRA Dall

Penultimate whorl with a short, strong, axial and a basal lamella only. Axis moderate, smooth. Type, *H. bilamellata*, Dall.

Subgenus METASTOMA, Strebel and Pfeffer.

Axis smooth, without plait or sinuosity, penultimate whorl without lamellæ. Type, *H. roemeri*, Pfeiffer.

This comprises most of the species usually denominated *Holospira.*

Subgenus COELOSTEMMA, Dall.

Axis vertically ribbed as in *Coelocentrum;* shell otherwise as in *Metastoma.* Type, *H. elisabethæ*, Pilsbry.

Genus COELOCENTRUM, Crosse and Fischer.

Subgenus SPARTOCENTRUM, Dall.

Axis as in *Bostrichocentrum;* otherwise as in the type of the genus Type, *C. irregulare*, Gabb.

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HOLOSPIRA (METASTOMA) CROSSEI, new species.

Shell small, compact, twelve-whorled, with two polished, smooth, blunt nuclear and four increasing whorls, followed by a cylindrical spire faintly transversely ribbed; suture distinct, base rounded with a shallow umbilical chink; aperture simple, slightly oblique, not projecting beyond the periphery of the preceding whorl, the lip entire, slightly expanded, without internal ridges. Height, 11; maximum diameter, 4 mm.

Top of Hachita Grande Mountain, New Mexico.

This resembles *H. goldfussii*, with an entirely different interior, and a less reflected and triangular peristome.

HOLOSPIRA (METASTOMA) PILSBRYI, new species.

Shell externally almost exactly like *H. tryoni*, Pfeiffer, as figured by Crosse and Fischer,[1] but that species has the internal characters upon which Strebel and Pfeffer based their section *Bostrichocentrum*. The present form has a height of 13 and a major diameter of 4 mm., and comprises two nuclear, six increasing, and six equal whorls.

Puebla, Mexico; Arizona, collected by Dr. Edward Palmer.

HOLOSPIRA (DISTOMOSPIRA) BILAMELLATA, new species.

Shell elongate, slender, blunt-tipped, with two smooth nuclear, six increasing, and nine subsequent equal whorls; sculpture of slightly raised, distant, straight riblets, obsolete on the middle of the shell, but strong on the last whorl, where they are crowded and rather irregular; umbilicus small, shallow; aperture as in *H. crossei*, but projecting beyond the periphery of the preceding whorl. Height, 20.5; maximum diameter, 5 mm.

Hachita Grande Mountain, New Mexico.

HOLOSPIRA (HAPLOSTEMMA) MEARNSII, new species.

Shell small, compact, with two nuclear, seven increasing, and five subsequent whorls; sculpture and aperture much as in *H. crossei*, the base slightly appressed and the ribs closer and more prominent than on the preceding whorls; umbilicus shallow; aperture projecting somewhat beyond the preceding whorl; the peristome hardly reflected, subtriangular, little thickened, and without folds internally; axis small, subcylindric, with a strong, short lamella near the base in the penultimate whorl; length, 14.5; major diameter, 4.5 mm.

Hachita Grande Mountain, New Mexico.

This resembles *H. crossei* externally, but is larger, with more projecting aperture.

HOLOSPIRA (BOSTRICHOCENTRUM) VERACRUZIANA, new species.

Shell closely resembling the enlarged figure of *H. microstoma*,[2] Pfeiffer, but with a shorter apical cone and larger aperture; it differs also by hav-

[1] Moll. Mexique. [2] Crosse and Fischer, Moll. Mex., p. 337, pl. xvii, figs. 9, 9*a*.

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ing 17 whorls in a total length of 17.5 mm., against 18 whorls in a length of 15.5 mm. for *H. microstoma*. The last whorl in the present species is rounded below, that of *H. microstoma* angulated. *H. veracruziana* has the one and a half nuclear whorls polished, those of the apical cone finely ribbed, those of the rest of the spire striate, with a few coarse riblets just behind the peristome.

Locality.—Mizantla, Province of Vera Cruz, Mexico.

Family BULIMULIDÆ.

Genus BULIMULUS, Leach.

Subgenus PSEUDORHODEA, Dall.

Shell slender, small, with a gyrate and pervious axis in the last whorl and a half, without internal laminæ; jaw as in *Thysanophora*. Type, *Columna ramentosa*, J. G. Cooper, Lower California.

This group has a superficial resemblance to the South American *Rhodea*, Adams, but an anatomical examination shows it to be most nearly related to the *Bulimuli* of the subgenus or section *Leptobyrsus*, especially *B. artemesia*, Binney.

BULIMULUS LEVIS, Dall.

Bulimulus xantusi var. *levis*, DALL, Proc. U. S. Nat. Mus., XVI, p. 641, 1893.—COOPER, Proc. Cal. Acad. Sci., 2d ser., IV, p. 139, pl. v, fig. 14.

Fresh specimens sent by Dr. Cooper show this to be perfectly distinct from *B. xantusi*.

BULIMULUS COOPERI, Dall.

Bulimulus pilula, CROSSE and FISCHER, not BINNEY; COOPER, Proc. Cal. Acad. Sci., 2d ser., IV, p. 139, pl. v, fig. 12, 1894.

This form, distinguished among other things by pale peripheral banding, is quite distinct from the true *B. pilula* of which the types are in the National Museum.

BULIMULUS BELDINGI, Cooper.

Bulimulus inscendens beldingi, J. G. COOPER, Proc. Cal. Acad. Sci., III, p. 209, 1892; p. 340, pl. XIII, fig. 5, 1893.

An examination of specimens sent by Dr. Cooper fails to show intermediate gradations between this species and *B. inscendens*. I have no doubt of its distinctness.

Family UNIONIDÆ.

UNIO MITCHELLI, Simpson, new species.

Shell rhomboidal, solid, rather inflated, rounded before, somewhat biangulate behind; dorsal margin curved; incremental lines strong, anteriorly irregular; epidermis varying from light brown to black, coarse, often shining; beaks moderately prominent, showing traces of

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rather strong concentric sculpture; cardinal teeth strong, short, rather ragged; laterals short, club-shaped, heavy, granular, or striated; nacre soft silvery white; shell near the beaks with obscure, narrow plications. Height, 33; length, 55; diameter, 20 mm.

Locality.—Guadelupe River, Victoria County, Texas, Hon. J. D. Mitchell; Rio Salado, near New Leon, Mexico.

This species probably groups with *Unio rowellii* and *scamnatus*, though no other members of the group have pustules or plications.

EPIPHRAGMOPHORA ARNHEIMI, Dall.

Arionta californiensis, LEA, var. *ramentosa*, GOULD, small variety, W. G. BINNEY, Bull. U. S. Nat. Mus., XXVIII, p. 133, fig. 108, 1885.

This small species has been referred to *californiensis* as a subvariety, but a series of forty-three very uniform specimens from various localities indicates that it is a distinct species.

Type.—No. 39612, U. S. N. M.; Nachoguero Valley, California, Dr. Mearns: San Pablo, Arnheim.

CERION (MAYNARDIA) PINERIA, new species.

Shell small, whitish, obliquely mottled with pale brownish flammules, sometimes nearly all brownish, with about eight whorls; nucleus smooth, brownish, of a whorl and a half, followed by fine, narrow, oblique, subequal riblets crossing the whorl, with about equal interspaces; apex dome-shaped; body of the shell subcylindrical, base slightly attenuated, with no umbilicus; aperture rounded, except over the body, with a thick, white, well-reflected lip, parietal and pillar lips each with a low medial tubercle or tooth; length of shell, 14; diameter, 6.5 mm.

This is nearest related to *Pupa cyclostoma*, Küster, but is small and easily distinguished by its finer, closer, and more even ribbing. Like all the species of its genus it is variable, and has among others a small variety with very regular ribbing which hardly exceeds 10 mm. in length, and is doubtless the smallest form belonging to the genus which has yet been reported.

Type.—No. 107329, U. S. N. M.; Isle of Pines, Johnson.

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DIAGNOSES OF NEW SPECIES OF MOLLUSKS FROM THE WEST COAST OF AMERICA.

By W. H. DALL,

Honorary Curator of the Department of Mollusks.

DURING the work of the *Albatross* on the west coast of America a number of interesting species new to science have been collected, some of which have been described and illustrated, but many more still remain to be worked up. Pending the completion of studies now in progress the following diagnoses of especially interesting forms are printed, to attract attention to certain groups not hitherto discriminated.

CALLIOSTOMA IRIDIUM, new species.

Shell thin, with pearly sheen; conical, with eight whorls; nucleus smooth, polished, bulbous, asymmetrical, of less than one whorl; subsequent whorls flattened, so that the sides of the spire are nearly straight, diverging at an angle of 60°, and sharply angular at the periphery, against which the suture is laid; base flattish, near the aperture more or less rounded, imperforate; sculpture on the spire of, first, a strong thread, bordering the suture on each side, this thread separated by a channel from the flattened area between the two threads, upon which area are (on the last whorl seven) spiral threads, which on the last whorl are beaded and separated by wider interspaces, above become fainter or lose the beading, are obsolete on whorls 4, 5, and 6, while on the apical whorls only the strong threads remain; the latter are also beaded on the later whorls; base spirally threaded, the threads more or less beaded by the intersection with them of arched, rather strong radiating lines of growth; threads stronger and more distant as they approach the smooth, broad axial rib; the periphery of the last whorl with two granulated keels; aperture subquadrate, brilliantly pearly, the pillar white, smooth, with no tooth or projection at its base; color of the shell pinkish-waxen, verging toward bluish near the apex, with variable delicate brown flammules, which cross or variegate the whorls and usually end as more or less distinctly paired brownish spots on the periphery of the last whorl, not being visible on the base; the

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nacre shines through the outer coating of the shell quite conspicuously when it is wet. Height, 20; maximum diameter, 18; height of aperture, 7 mm.

West Mexico, in deep water; also at U. S. Fish Commission station 3387, and in the gulfs of Panama and California, in about 100 fathoms.

Type.—No. 122957, U. S. N. M.

This elegant species has an operculum with a great many very narrow whorls and entire margin. The animal is brilliantly painted with scarlet and black, and has well developed eyes and an unusually long muzzle.

CALLIOSTOMA TURBINUM, new species.

Shell small, margaritæ-form, with six and a half rounded whorls; nucleus minute, white, smooth, of one whorl, followed by strongly sculptured, rather inflated whorls separated by an inconspicuous suture; sculpture on the spire of rather elevated, narrow, spiral ridges, of which the most posterior is always beaded, though the beading on the others fails on the apical whorls; in front of this ridge is a smaller one, then three, or on the last whorl five, subequal, larger ones, the third forming the periphery of the whorl, the suture being laid against the most anterior ridge; the base has about twelve, subequal, more crowded, spiral threads, faintly or not at all beaded, larger toward the axis; the body of the shell is of a nacreous waxen tint, with transverse flammules of dark brown, which articulate the spirals, are much fainter on the interspaces, but do not reach the base, on which the spirals are more or less articulated with reddish-brown; the base is somewhat flattened, the periphery not keeled, the pillar short, white, with a minute umbilical chink; aperture subquadrate, nacreous, sulcate by the external sculpture; there is no projection at the distal end of the pillar. Height, 12; major diameter, 12.5 mm.

U. S. Fish Commission stations 2902 and 2972, among the Santa Barbara Islands, in about 100 fathoms.

Type.—No. 122578, U. S. N. M.

This is a pretty species, with a polished outer coat, through which the nacre shines very distinctly.

Genus ANAPLOCAMUS, Dall.

Shell short-spired, with a thick brown periostracum, with a simple, sharp, outer lip, parietal callus, arched pillar, the anterior extreme of the aperture slightly produced and pointed, as in some Litorinas; the base imperforate, the aperture destitute of liræ, teeth, or other projections; operculum, relatively to the size of the animal, large; area of attachment, small; form, U-shaped, the apex without any spiral inclination, rather blunt, the increment being applied to the proximal end, and the edges entire.

Type.—*A. borealis*, Dall.

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ANAPLOCAMUS BOREALIS, new species.

Shell short, rude, of about four and a half whorls (the apex in each specimen eroded), smooth, except for lines of growth and darker lines, which might indicate resting stages; whorls somewhat flattened above and near the apex, more or less appressed at the suture; periphery rounded, or, in the younger shells, obscurely angular; base full, smooth, with no indication of an umbilicus or axial depression; aperture sub-ovate, pointed in front or behind; outer lip thin, sharp, simple; pillar rather thick, white, with a smooth, well-marked callus over the body; operculum dark brown, with strong incremental lines. Height of (somewhat eroded) shell, 17; of last whorl, 15; of aperture, 10; major diameter of shell, 13; of aperture, 7 mm.

Pacific Ocean, south of Unimak Island, in 61 fathoms, mud, C. H. Townsend.

Type.—No. 122592, U. S. N. M.

This very remarkable shell recalls a fresh-water genus at once, and would easily be overlooked amid a quantity of *Anculosa dilatata*. But, when studied, it is seen to be unlike any fresh-water form or any marine form hitherto known. It is probably referable to the family Trichotropidæ, as the peculiar production of the aperture, the thick, brown epidermis, and the curious operculum all have points in common with species of *Trichotropis*.

SOLARIELLA NUDA, new species.

Shell turbinate, recalling *Margarita*, smooth, polished, except for obscure spiral markings which do not interrupt the surface, of about four whorls; color, white, with a pink or blue nacre glowing through; whorls rounded, flattened in front of the suture; base rounded; umbilical margin keeled; umbilicus wide, funicular; aperture rounded, oblique, hardly angulate by the umbilical rib, and with a very short interruption between the inner and outer lips; operculum light brown, thin, with about ten whorls. Height, 15; major diameter, 19; minor diameter, 15.5 mm.

U. S. Fish Commission stations 2928, 3187, and 3348, in 298 to 455 fathoms, off Lower California.

Type.—No. 122580, U. S. N. M.

SOLARIELLA CERATOPHORA, new species.

Shell thin, with a pale olive, silky epidermis, and six whorls beside the (decollate) nucleus; early whorls smooth, gradually taking on two rows of projecting points or sharp nodules, which are, on the later whorls, connected by a slender spiral thread; periphery with a slender granular thread, on which the suture is laid; base with five similar threads, closer as they approach the umbilicus; umbilicus small, verti-

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cally striate; aperture rounded, slightly angulated by the sculpture; the outer lip thin, sharp; the inner reflected over part of the umbilicus. Height, 28; diameter, 24 mm. The operculum has four or five whorls.

U. S. Fish Commission station 3432, in 1,421 fathoms, mud, in the Gulf of California, off La Paz.

Type.—No. 122960, U. S. N. M.

The single specimen obtained has repaired an injury of the base so as to somewhat distort the umbilical region. Except for the presence of an umbilicus this might well be referred to *Turcicula* or *Bathybembix*, and examination of the anatomy may show that to be its proper location.

RIMULA (?) EXPANSA, new species.

Shell low, rounded, expanded; apex small, prominent, subcentral, recurved to the right; foramen like an exclamation point without the dot (!), the small end anterior, the suture in front of the foramen inconspicuous, marked by a narrow raised line on the interior of the shell; anterior slope convex, gently rounded; posterior a little excavated; sculpture of evenly spaced, similar, close, fine, rounded threads overrunning radiating, rounded, little elevated threads of three sizes, the larger starting at the apex, the others intercalary toward the periphery as the interspaces widen; margin of the shell slightly crenulated by the sculpture; interior smooth, yellowish white, the septum convexly arched without buttresses. Height, 10; length, 32; width, 26 mm.

U. S. Fish Commission stations 3358, in 555, and 3047, in 885 fathoms, Gulf of Panama.

Type.—No. 122967, U. S. N. M.

This species recalls *R. asturiana*, Fischer, but is lower and more expanded, a thinner shell, and with more delicate sculpture.

EMARGINULA FLABELLUM, new species.

Shell small, translucent white, depressed, wider in front, narrow behind, squarish at both ends, with the incurved apex terminal behind; slit short, one-fourth as long as the shell, widest in front, straight; fasciole depressed, with an elevated keel on each side; sculpture of fine concentric incremental lines and very fine elevated threads, which start from the anal fasciole and curve outward toward the margin with very few intercalated threads; margin smooth, interior polished, the fasciole convex inward; front margin twice as wide as the posterior margin. Length, 10; height, about 2.5 mm.

U. S. Fish Commission station 2932, in 460 fathoms, sand, off Clarion Island, Lower California.

The only specimen taken, though living, was slightly crushed.

CHORISTES CARPENTERI, new species.

Shell large, solid, of three and a half rounded whorls, covered with a pale olivaceous epidermis, sculptured only with somewhat irregular,

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rude, incremental lines; suture deep, the whorl in front of it slightly excavated; base rounded, the umbilicus narrow, deep; aperture subovate, not interrupted by the body; the inner lip nearly straight, the outer lip simple, sharp-edged; the interior of the aperture white. Height (somewhat eroded), 21; diameter, 21 mm.

U. S. Fish Commission station 3382, in 1,793 fathoms, mud; Gulf of Panama.

Type.—No. 123039, U. S. N. M.

This is the second species of this very interesting genus, and the first from the Pacific. It is larger, more elevated, and much more solid than the form from the North Atlantic on which Dr. P. P. Carpenter erected the genus.

BENTHODOLIUM PACIFICUM, new species.

Shell resembling *B. abyssorum*, Verrill and Smith, from the North Atlantic, from which it differs by its much more elevated spire with the same number of whorls, its smaller last whorl and aperture in proportion to the whole shell, its more slender pillar and larger umbilicus, and especially by having its spiral sculpture less crowded, and reticulated by narrow, flattened threads overrunning the spirals and in harmony with the lines of growth. Height, 30; diameter, 20 mm., but less perfect specimens attain twice this size.

U. S. Fish Commission station 3375 in 1,201 fathoms, ooze, near Malpelo Island, Gulf of Panama.

Type.—No. 123031, U. S. N. M.

The operculum is narrower and less spiral than that of the Atlantic species.

PHOS COCOSENSIS, new species.

Shell elongate, acute, eleven-whorled, including a nucleus of four whorls; color, yellowish white, with variable brown spiral banding; sculpture of 11 or 12 narrow, little elevated, distant ribs, more or less angulated at the shoulder; spiral sculpture of numerous rather sharp, close threads, flatter on the last whorl, with a few more prominent between the suture and the shoulder; suture distinct, whorls moderately rounded; aperture longer than wide, with an entire outer lip, slightly thickened and internally lirate; throat white, pillar with a groove near its anterior edge; canal short, deep; siphonal fasciole moderate; body with a thin white callus. Height, 47; last whorl, 28; diameter, 19 mm.

The operculum is smooth-edged, as in *Fusus*.

U. S. Fish Commission station 3368 in 66 fathoms, near Cocos Island, Gulf of Panama.

Type.—No. 123010, U. S. N. M.

COMINELLA BRUNNEOCINCTA, new species.

Shell compact, solid, livid pinkish, with narrow, brown, distant, spiral lines and a few brown flammules near the suture; nucleus smooth,

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small, white, of two whorls, followed by five subsequent whorls; spire acute, whorls moderately rounded, the last much the largest; sculpture on the early whorls decussate by fine transverse riblets, strongest near the suture, and flattish spiral threading; later the whorls are polished, smooth, except for lines of growth and narrow, distant, sharp grooves; suture with a narrow channel; aperture long, narrow, with a shallow narrow sinus behind and a deep siphonal sulcus in front; outer lip thickened, flexuous, obscurely lirate behind, body with a thin callus; pillar white, concave, with a prominent margin, shorter than the aperture. Operculum narrow, elongate oval, with an apical nucleus. Height of shell, 31.5; of last whorl, 24.5; diameter, 13 mm.

U. S. Fish Commission station 3390, in 56 fathoms, sand; temperature, 62.6°; in the Gulf of Panama.

Type.—No. 122009, U. S. N. M.

FUSUS (?) RUFOCAUDATUS, new species.

Shell elongate, acute, thin, with six or more whorls (partly eroded) covered with a delicate yellow-brown epidermis, the pillar and canal, when fresh, of a pronounced rufous-brown or brown-pink, which fades more or less in the dry shell; whorls drawn out, rounded, with a deep but not channeled suture; nucleus eroded; the remaining whorls sculptured with about a dozen flattened subequal spirals with narrower grooves between them, crossed by lines of growth and (on the last whorl about 20) sharp flexuous riblets, which cross the whorl and are obsolete on the canal; base attenuated; pillar long, very straight, attenuated, twisted, almost pervious; aperture narrow; outer lip very thin, sharp, concave near the shoulder, produced in front, modified by the sculpture, but not lirate. Height of (eroded) shell, 30; of last whorl, 21; diameter, 9 mm.

U. S. Fish Commission stations 3360, 3374, 3392 and 3415, in 1,270 to 1,879 fathoms, Gulf of Panama.

This elegant little shell recalls *Boreotrophon* in its sculpture, and may not be a true *Fusus*. The spirals in some of the specimens are narrower and more numerous than in the type, and in the young the ribs are less sharp and the color more ashy.

Genus TRACTOLIRA, Dall.

Shell slender, drawn out in its coil, fusiform, with a short canal and pervious axis; outer lip simple, not expanded or lirate; body not callous, the axis twisted, with a single strong plait at its anterior edge, the young showing five or more narrow, low, thread-like ridges behind the one above mentioned, but which become obsolete in the adult.

This singular shell appears to be a degenerate abyssal form of Volutidæ, but which can not be assigned to any of the genera yet established.

Type.—*T. sparta*, Dall.

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TRACTOLIRA SPARTA, new species.

Shell elongate, slender, with a greenish or ashy adherent epidermis (more or less eroded near the apex in all the specimens), and about six whorls; nucleus apparently as in *Scaphella*, large, with an apical spur; whorls drawn out, rounded, with a distinct suture, the upper whorls at first smooth, then with irregular, partly obsolete, transverse wrinkles, some of which cross the whorl, but which are too irregular to call ribs; surface everywhere sculptured with numerous, even, fine, flattish spiral threads, with equal or slightly wider interspaces, and with well marked but not regular lines of growth; aperture subovate, rather wide in front, the outer lip simple and hardly thickened; the throat white, a thin wash of callus on the body, the pillar thin, pervious, short; the canal short and wide, with hardly any siphonal fasciole; operculum absent. Height of shell. 60; of last whorl, 43; of aperture, 28; diameter, 19 mm.

U. S. Fish Commission stations 3360, 3374, 3414 and 3415, in 1,672 to 2,232 fathoms, Gulf of Panama, to Acapulco, Mexico.

Type.—No. 122999, U. S. N. M.

This is a very characteristic and singular abyssal shell.

SCAPHELLA BENTHALIS, new species.

Shell recalling *S. magellanica*, Sowerby, but stouter, with more rounded whorls, the aperture shorter and wider, with a broad flexure where the lip turns to meet the body whorl, while in *S. magellanica* the posterior part of the aperture is pointed; the latter has two strong plaits on the pillar; *S. benthalis* has three, all obsolete, the middle one most perceptible, and has a less-marked canal and siphonal fasciole. The interior of the aperture is pale flesh color; the exterior seems to have been like that of *S. magellanica*, but is almost entirely decorticated. It has five whorls beside the nucleus, and there is no operculum. Height, 125; of the last whorl, 90; of the aperture, 70; width of the aperture, 35; of the (decorticated) shell, 60 mm.

U. S. Fish Commission station 3360, in 1,672 fathoms, sand, in the Gulf of Panama; temperature at bottom, 42° F.

At first sight one would be disposed to think that this specimen represented a northward extension by 3,300 miles of the Magellanic species, but a more careful examination shows numerous points of difference.

CANCELLARIA CENTROTA, new species.

Shell solid, short, ashy or pinkish white, with a smooth, small nucleus of two whorls, and five and a half strongly sculptured subsequent whorls; spire subtabulate, rather pointed; sculpture of five or six strong spiral threads, of which that at the shoulder is much the largest, crossed by (on the last whorl nine) sharp, recurved varices, spiny at the

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intersections in well-developed specimens, the spines at the shoulder much longer than the others, while in some depauperate specimens the only spines are at the shoulder; there is also some obscure spiral striation between the threads on the last whorl, and the lines of growth are irregular and often prominent; aperture subtriangular, with three strong plaits on the pillar, and, in fully adult shells, some faint liration inside the outer lip; canal short, distinct, forming a strong fasciole around a narrow, deep umbilicus, over which the inner lip is partly reflected; body with a wash of callus; throat whitish. Height of shell, 35; of last whorl, 25; of aperture, 18; width of shell exclusive of the spines, 20 mm.

U. S. Fish Commission station 3368, in 66 fathoms, near Cocos Island, Gulf of Panama.

Type.—No. 122996, U. S. N. M.

This is the most thorny species yet described.

CANCELLARIA IO, new species.

Shell fusiform, solid, whitish or pink, with a more or less olivaceous epidermis, and about six whorls; spire pointed, whorls rounded, somewhat constricted in front of the suture, which is appressed; sculpture of numerous flattened spiral threads, with about equal interspaces, uniform over the whole surface, but with occasional finer intercalary threads; these are crossed by (on the last whorl about 13) rather stout, rounded ribs, strongest at the shoulder, obsolete beyond the periphery, and not reaching the suture behind them; aperture rather long, outer lip simple, smooth, not reflected or lirate; pillar rather straight, with three strong plaits; canal shallow, wide, pointed, making no perceptible fasciole; umbilicus none; body with a thin wash of callus. Height of shell, 43; of last whorl, 33; of aperture, 25; width of last whorl, 21 mm.

U. S. Fish Commission station 3354, in 322 fathoms, Gulf of Panama.

This species has much the look of a gigantic *Admete*, but without the arched pillar. Most of the specimens were eroded, and the species has a genuine abyssal aspect.

PLEUROTOMA (STEIRAXIS) AULACA, new species.

Shell large, solid, white, fusiform, with about five whorls (nucleus eroded) covered with a pale straw-colored epidermis; whorls rounded, with rather distinct lines of growth crossed by numerous very sharp, narrow, prominent, subequal spiral ridges with about equal or narrower interspaces; the periphery is formed by a sort of rib, on which stand two to four similar keels, but smaller than the others and more crowded; in front of the rib there is a faint constriction of the whorl; the keels are less prominent on the canal, which is moderately long and recurved; on the penultimate whorl there are about 14 keels between the sutures; aperture elongate, reflecting the sculpture, but without

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liræ; outer lip very flexuous, with a broad, rather shallow anal sulcus behind, and arched forward in front of the peripheral rib; body white, not callous; pillar thin, attenuated, and obliquely truncate in front, concave, twisted, exhibiting a pervious axis; canal shallow, not producing a fasciole; operculum like that of *Mohnia frielei*. Height of shell, 60; of last whorl, 48; of aperture, 38; maximum diameter, 26 mm.

U. S. Fish Commission station 3415, in 1,879 fathoms, globigerina ooze; bottom temperature, 36° F.; off Acapulco, Mexico.

Type.—No. 123099, U. S. N. M.

The initiatory part of the operculum is spiral, as in *Mohnia*, thus differing from the other deep-water Pleurotomidæ, which it in general resembles. They have the nucleus of the operculum apical and not spiral.

If it be thought necessary to use a sectional name for this species, it might be called *Steiraxis*, differing from the other Pleurotomas as *Mohnia* differs from the species of *Chrysodomus*.

PLEUROTOMELLA CASTANEA, new species.

Shell polished, thin, resembling *P. cingulata*, Dall, of a chestnut-brown color, fading to a paler pinkish-brown, with seven whorls, the nucleus eroded, the early whorls with four or five flattened elevated spirals with wider interspaces in front of a somewhat sloping anal fasciole, more or less reticulated by narrow, slender, irregular, elevated riblets in harmony with the lines of growth, and which form on the fasciole delicate arches concave forward; the suture is appressed; on the body are about 20 spirals, stronger at the shoulder, smaller and closer forward, the wide interspaces finely spirally striate, while the most prominent spirals are undulate or obscurely nodulous; the transverse sculpture is nearly obsolete and hardly to be distinguished from the incremental lines; aperture elongate, oval; outer lips thin, sharp, crenulated by the sculpture, but not lirate; anal sulcus shallow, wide, directly in front of the suture; body with a thin wash of callus; pillar thin, gyrate, attenuated in front, forming a narrowly pervious axis, the whole of a pinkish-brown color; canal short, shallow, not recurved. Height of shell, 53; of last whorl, 38; of aperture, 28; diameter, 23 mm.

U. S. Fish Commission, station 3400, in 1,322 fathoms, ooze; temperature, 36° F.; eastward from the Galapagos Islands.

Type.—No. 123134, U. S. N. M.

This differs from *P. cingulata*, Dall, by its smaller size, more sloping whorls, more delicate and reticulate sculpture, and by its pervious axis. The animal is blind, and there is no operculum.

NUCULA IPHIGENIA, new species.

Shell large, solid, much like *Iphigenia brasiliana* in outline, anterior end produced, rounded, longer than the posterior; hinder end obliquely truncate, attenuated; beaks elevated, somewhat pointed, opisthogyrous;

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sculpture of feeble, narrow, irregular concentric wrinkles, crossed by fine, sharp, rather distant incised lines; lunule narrow, elongate, bordered by a faint ridge; escutcheon small, broader than long, set off by an impressed line from the large posterior area, which is flattened but not definitely limited, the margin of the valve projecting somewhat in the middle line; base rounded in front, somewhat impressed posteriorly; interior brilliantly nacreous, with a strong pallial line and subequal adductor scars; the pallial area more or less punctate; basal margin denticulate; hinge with about 30 anterior and 15 posterior teeth, strong, projecting, and somewhat angular; chondrophore narrow, pear-shaped, projecting forward from the hinge line. Height of shell, 22.5; length, 35; diameter, 16 mm.

U. S. Fish Commission station 3396, in 259 fathoms, Gulf of Panama; temperature, 47.4° F.

Type.—No. 122896, U. S. N. M.

This fine shell is one of the largest known, and peculiar from its elongated shape and posterior attenuation. The periostracum seems to have been thin, dull, and yellowish.

LIMOPSIS COMPRESSUS, new species.

Shell large, thin, compressed, with a yellowish-brown, pale, pilose epidermis; surface reticulated with fine radiating striæ and rather irregular elevated lines of growth; beaks low, but conspicuous, small, and swollen; area narrow, long, about equal on each side of the beaks; dorsal line straight, anterior end rounded, posterior produced, rounded; interior white, smooth, with plain margins; posterior adductor scar larger and lower than the anterior; ligament central, lozenge-shaped, thin; hinge with about six posterior and eight anterior teeth, small, obscure, separated by a wide edentulous space, and obsolete in senile specimens. Length of shell, 45; height, 37; diameter, 17.5 mm., exclusive of the hair-like processes of the periostracum.

U. S. Fish Commission station 3382, in 1,793 fathoms, Gulf of Panama; temperature, 36° F.

Type.—No. 122889, U. S. N. M.

PHILOBRYA ATLANTICA, new species.

Shell small, thin, short-mytiliform, covered with a conspicuous, thin, greenish epidermis, prominent on the ribs and at the margin; valves rather inflated, the beaks crowned with the subovate glochidial valves of the nepionic young, bordered by a narrow elevated margin, then smooth and inflated for a short distance, then radiately ribbed, with about 11 squarish elevated ribs, marked with projecting epidermis, between which the margin is slightly excavated; anterior end short, projecting a little beyond the beaks; area linear, amphidetic; ligament internal, short, almost terminal; interior of valves smooth, the hinge line rather broad, edentulous; the scars as in *Mytilus;* the byssal gape very narrow. Length of shell, 4; breadth, 3; diameter, 2 mm.

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U. S. Fish Commission station 2770, off Spiring Bay, Argentine coast; attached to seaweed dredged in 58 fathoms.

Type.—No. 97057, U. S. N. M.

This little species is interesting as being the first marine Pelecypod in which the existence of a glochidium stage was recognized. An examination of *P. setosa*, Carpenter, from Cape St. Lucas shows that it agrees in this particular. The genus was originally named *Bryophila*, which proved to be preoccupied, and was changed to *Philobrya*.[1] The genus is apparently related to *Pteria*, rather than to *Pinna*, as supposed by Carpenter.

CALLOCARDIA STEARNSII, Dall.

Callocardia stearnsii, DALL, Proc. U. S. Nat. Mus., XVII, p. 693, fig. 1 A, 1895.

Shell closely resembling *C.* (*Vesicomya*) *venusta*, Dall, but larger, less inflated, the anterior end higher, the base more rounded, and the posterior end more angular and proportionally longer. Internally the flexure in the pallial line below the posterior adductor scar is more marked, and the ligament and also the posterior tooth in the right valve are conspicuously shorter. *C. stearnsii* has the same pale straw-colored epidermis and feeble incremental sculpture as *C. venusta*, but the lunule is narrower and the line circumscribing it less impressed. Height, 17.5; length, 25; diameter, 11.5 mm.; the vertical of the beaks is behind the anterior end about 7 mm.

Off the coast of Washington, near Tillamook, at U. S. Fish Commission station 3346, in 786 fathoms, mud; temperature, 37.3° F.

This genus is remarkable for its subfoliobranchiate gills, so very different from the loosely reticulate branchia of the shallow-water *Isocardia*, with which until recently *Callocardia* was associated as a mere subgenus. These are described in the paper to which reference is made above, but, the species having been only named in manuscript at that time, it was thought best to add the present description.

CALLOCARDIA LEPTA, new species.

Shell large, thin, earthy, white, compressed, with an olivaceous or yellowish, dehiscent epidermis, with concentric wrinkles and projecting laminæ, which in the young are somewhat regularly spaced and distant, in the adult crowded and irregular; beaks small, low, not conspicuous, moderately inflated; valves evenly arcuate below, rounded at both extremities, the anterior shorter and less high than the posterior; lunule narrow, long, bounded by an incised line; ligament external, long, set in a groove, with the escutcheon narrow, its edges elevated above the dorsal margins of the valves and obtusely keeled, extending one-half longer backward than the length of the ligament; interior smooth, or

[1] Smithsonian Miscellaneous Collections, X, No. 252, Mollusks of Western North America, by P. P. Carpenter, index, p. 21, December, 1872.

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slightly radially striate, margins flattish, smooth; anterior adductor scar narrow, posterior wider, the pallial line joining it in front of its posterior edge, producing an indentation, though not a sinus, of the pallial line; hinge narrow; teeth small, compressed, three (more or less obscure) in each valve; in the right a long, strong anterior lamella, extending most of the way between the umbo and the adductor scar, with a socket around its posterior end, above this a short, small, thin lamina, joined around the socket with a thicker lamina, obscurely wavy and extended backward; in the left valve a stout subtriangular central, joined to a thin, short, anterior lamina, with a socket under it; a short, obscure, radial tooth behind the central one; no lateral teeth in either valve, and the cardinals, as usual in this group, somewhat variable, obscure, or ill-defined. Height of shell, 40; length, 58; diameter, 23 mm.; the vertical of the beaks, 17 mm. behind the anterior end of the shell.

Type.—No. 126751, U. S. N. M., from U. S. Fish Commission station 3009, in the Gulf of California, off Concepcion Bay, in 857 fathoms, mud; temperature, 38° F. Also specimens (No. 106857, U. S. N. M.) from station 3346, off Tillamook, Oregon, in 786 fathoms.

This large, rather compressed species has somewhat the outline of the Indo-Pacific *Tapes*.

CALLOCARDIA OVALIS, new species.

Shell resembling the last species, but smaller, more oval, the posterior dorsal border more arched, the proportional inflation greater, the lunule wider, the ligament proportionally and actually longer, the epidermis more adherent and without projecting fringes or lamellæ; internally the teeth are smaller and more feeble, and the pallial line recedes less at the posterior adductor scar. Height, 26; length, 36; diameter, 16 mm.; the vertical of the beaks 8 mm. behind the anterior end of the shell.

U. S. Fish Commission station 3360, in the Gulf of Panama, in 1,672 fathoms, sand; temperature, 36.4° F.

Type.—No. 106898, U. S. N. M.

CALLOCARDIA GIGAS, new species.

Shell large, rather thin, inflated, with a thin, wrinkled, olivaceous epidermis over an earthy, concentrically, irregularly striated surface; beaks low, inconspicuous; lunule and escutcheon somewhat impressed, but not limited by any distinct line; valves elongated, recalling the shape of *Modiola capax*, Conrad, in a general way; the anterior side shorter and less high, the base impressed in the middle, more expanded in front and behind; dorsal margin rather evenly arched; both ends rounded; internally dentition strong, like that of *C. lepta*, but more distinctly developed; ligament short (about 20 mm.), set in a groove; interior of valve somewhat radially striate; posterior adductor scar

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somewhat larger, the pallial line set in below it, somewhat irregular, but not forming a distinct angular sinus; margins of valve thin, smooth. Height, 63; length, 110; diameter, 50 mm.; vertical of the beaks, 24 mm. behind the anterior end of the shell.

U. S. Fish Commission station 3009, off Concepcion Bay, in the Gulf of California, in 857 fathoms, mud; temperature, 38° F.

This relatively enormous shell was obtained only as a number of fresh valves without the soft parts but from the shell characters it can hardly be anything but a giant *Callocardia*.

CALLOGONIA ANGULATA, new species.

Shell elongate, moderately inflated, the surface as in the other species; the anterior end rounded, shorter; the posterior end produced, pointed; ligament short, set in a groove; the posterior dorsal border marked by two obscure ridges radiating from the beak, the outer one of which terminates at the posterior extreme of the valve, angulating the margin; the epidermis is denser and lamellose in the interspaces between these ridges; lunule obscure; basal margin nearly straight, rounded up toward the ends; beaks low, anterior; interior white, with some radial striæ; hinge narrow; right valve with two low cardinals coalescent above, and a third, higher, springing between them; pallial line distinct, with an angular, rather short, sinus. Height, 35; length, 58; semidiameter, 10 mm.; the vertical of the beaks, 18 mm. behind the posterior end of the shell.

U. S. Fish Commission station 3392, in 1,270 fathoms, hard bottom; temperature, 36.4°; in the Gulf of Panama.

A single right valve of this distinct species was collected as above, and differs from *Callocardia* especially by its angular pallial sinus.

PERIPLOMA STEARNSII, new species.

Shell suborbicular, thin, whitish, with pale straw-colored epidermis, sculptured with faint concentric irregularities harmonizing with the lines of growth and by very fine pustules arranged in radiating lines, stronger and more adjacent near and upon the rostrum; beaks not prominent, fissured; left valve slightly less convex than the right; rostrum about two-thirds as wide as the shell, not strongly differentiated, but with the epidermis coarser, and, especially on the left valve, more raised and wrinkled, and the basal margin slightly excavated; interior faintly pearly; pallial sinus large, rounded, shallow; chondrophore strong, spoon-shaped, inclined obliquely forward. Length of shell, 46; height, 35.5; diameter of the right valve, 9 mm.; the rostrum 20 mm. wide, rounded, and moderately gaping; total diameter, 18 mm.

U. S. Fish Commission station 3034, in 24 fathoms, mud; off Point Fermin, at the head of the Gulf of California.

This differs from *P. discus*, Stearns, in the radial arrangement and larger size of its surface granules, its wider rostrum and more compressed form. It needs no comparison with other species.

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PERIPLOMA CARPENTERI, new species.

This species is of much the outline of *P. stearnsii*, Dall, and is best described by comparison with it. In *P. stearnsii* the shell is somewhat less inflated and the beaks are nearer the posterior end, but nearer the anterior end in *P. carpenteri*; in the latter the surface granules are more crowded and coarser and not arranged in rows separated by a clear space, as in *P. stearnsii;* the rostrum in *P. carpenteri* is less distinctly marked off from the arch of the base, the epidermis has a more greenish tint, the interior is more pearly, with a larger pallial sinus, and the chondrophore is wider and vertically, not obliquely, directed. The right valve is 10 mm. in diameter, with a height of 39 and a length of 47 mm.

Only one right valve was dredged at the U. S. Fish Commission station 3389, in 210 fathoms, mud, in the Gulf of Panama.

Type.—No. 106891, U. S. N. M.

This is the third orbicular species from West America.

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DIAGNOSES OF NEW TERTIARY FOSSILS FROM THE SOUTHERN UNITED STATES.

By W. H. DALL,
Honorary Curator of the Department of Mollusks.

A LARGE number of interesting or new species have recently been received by the Museum from the States bordering on the Gulf of Mexico, partly from friends of the National Museum and partly from the U. S. Geological Survey. Some of these are described in the following pages, but many more remain to be investigated. As it is desirable that as full a list as practicable of species belonging to each horizon shall be known, the following diagnoses are offered preliminary to the illustrated report upon them, which is in preparation.

Genus CAROLIA, Cantraine.

Subgenus WAKULLINA, Dall.

Shell with the single chondrophore of *Monia*, the obsolescent byssal notch and plug and simple adductor scar of *Ephippium*. The sensible but narrow cardinal area of *Ephippium* is here represented by a broad and conspicuous margin; the lateral edges of the ligamentary scar in the left valve form narrow, elevated crura, and the exterior is destitute of the radiating sculpture common to all the other forms of the group, and resembles that of the smooth Anomias.

Type.—Carolia (*Wakullina*) *floridana*, Dall.

CAROLIA (WAKULLINA) FLORIDANA, new species.

Shell thin, smooth, nacreous, adherent to other bodies, suborbicular, more or less irregular; right valve flattened or concave, especially at the umbo; left valve convex, with a moderately prominent umbo near the cardinal margin; hinge margin variable, but always with a transverse flattish area arched in the middle over the attachment of the internal ligament; exterior irregularly imbricated by the scaly nacreous layers; interior smooth, with a large subcentral, nearly orbicular

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adductor scar; the minute sealed byssal foramen, under the middle of the chondrophore, connected by a soldered linear suture with the upper anterior margin of the valve; chondrophore rounded, triangular, broad, radiately rugose above, recurved as a thin lamina from the umbo in fully adult specimens, rather closely sessile, and fitting into the umbonal cavity of the left valve; left valve, with the ligamentary attachment broadly triangular, marginated by a thin shelly lamina on each side, and arched over by the elevated portion of the cardinal area; there is no trace of a byssal-muscle scar in adult examples. Breadth in either direction about 110; maximum diameter of the closed valves, 9 mm.

Sopchoppy limestone, on the banks of Deep Creek, near the Sopchoppy River, Wakulla County, Florida, collected by the U. S. Geological Survey.

The original *Carolia* is from the Eocene of Egypt; the present species from the older Miocene of the Gulf border.

OSTREA PODAGRINA, new species.

Shell compact, thick and heavy, wider than high, with very short wide beaks, coarsely imbricated surface, inflated shell, with three or four strong, wide, rather irregular radial plications; interior smooth, distinctly marginated, with a large subcentral adductor scar; hinge and beak flat, the ligamentary area in the flat valve hardly excavated, the edges of the flat valve near the cardinal border with two obscurely wrinkled projecting crura, which fit into shallow depressions in the opposite valve; elsewhere there are no striæ or pustules on the edge of the valves. Height, 110; width, 100; diameter, 50 mm.

West bank of the Suwanee River, Florida, at station 2612, in the uppermost Eocene bed.

OSTREA FALCO, new species.

Shell thin, the fixed valve thin, irregular, cellular or deep, adherent over most of its surface, having a deep umbonal cavity under the cardinal border; the exterior rude, not perceptibly sculptured; free valve flat, thin, with a very acute, usually curved, flat beak; the interior margins with a row of strong pustules extending two-thirds the length of valve from the beak, and fitting into corresponding pits in the fixed valve; adductor scar small, rather laterally situated; the valve as a whole more or less arcuate; exterior showing remains of a purplish tint, with low, numerous, even, concentric imbrications, each of which is finely radially threaded, with rather wider interspaces between the threads; general outline flabelliform, wide, and rounded in front and acutely pointed behind. Height of a medium-sized specimen, 52; width, 35; diameter, about 19 mm., but very irregular in different specimens.

Jackson Eocene, in the Zeuglodon bed, near Cocoa post-office, southern Alabama, collected by Messrs. Burns and Schuchert.

Type.—No. 129972. U. S. N. M.

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Oysters are proverbially difficult and obscure mollusks, but probably no other species, recent or fossil, is more characteristic and distinct than the one above described.

TURRITELLA ALCIDA, new species.

Shell resembling T. *æquistriata*, Conrad, but more acute and more rapidly enlarging, shorter, with the anterior ridge on the whorl compressed and almost keeled, closer to the suture in front, to which the base drops abruptly, and, on the final base, flatter; owing to the form of the base and the constriction of the upper part of the whorl, the turns appear to overhang the suture. Length, 85; diameter, 21.5 mm., in a specimen with 17 whorls.

"Alum Bluff sands," horizon of the older Miocene, at Oak Grove, Santa Rosa County, Florida; also in the same bed at Rock Bluff, Appalachicola River, Florida.

Characteristic of this horizon and confined to it.

ACTÆON CHIPOLANUS, new species.

Shell small, fusiform, with six whorls; an elevated spire, acute except for the rather blunt apical whorl, brilliantly polished all over and sculptured only by a few incised lines in front of the periphery, and more crowded, and becoming more crowded anteriorly; suture distinct, almost channeled; nucleus small, rounded, the sinistral part buried in the whorl; aperture about equal to the spire, narrow, rounded in front, with a thin edge continuous with the pillar; pillar thin, with a single plait; umbilical region impressed. Altitude, 6.3; major diameter, 2.6 mm.

Habitat.—Chipola beds (2213), 1 mile below Bailey's Ferry, Calhoun County, Florida.

Types.—No. 113860, U. S. N. M.; also specimens in the collection of T. H. Aldrich.

Not very different from *A. punctostriatus*, which is proportionally shorter, stouter, less glossy, and with the spire-angle less acute.

ACTÆON (RICTAXIS) FUSULUS, new species.

Shell small, very slender; specimens decollate, but originally with five or more whorls; surface polished, slightly striated by the incremental lines; whorls spirally grooved by about 25 strong, channeled grooves, which become more close-set anteriorly; these grooves are crossed by elevated incremental lines, regularly equidistant and close-set, giving a punctate appearance to the grooves; the interspaces near the suture considerably wider than the grooves and flattened, anteriorly equal to the grooves and somewhat rounded, and elevated so as to look thread-like; suture distinct, not deep; aperture narrow, rounded in front, crenulated on the edge by the sculpture. the outer lip rounded

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in front, but not quite continuous with the obliquely truncate pillar; pillar short, concave, with a strong plait behind at its junction with the body. Longitude of decollate type, 7.5; of last whorl, 6; of aperture, 4.5; maximum diameter, 2.5 mm.

Habitat.—Chipola beds, with the last species.

Types.—No. 113863, U. S. N. M.; also specimens in Mr. Aldrich's collection.

This is a peculiar and characteristic species not like any heretofore known from American Tertiary or recent faunæ, and easily recognized by its slender, drawn-out form and sharp spiral sculpture.

ACTÆON MYAKKANUS, new species.

Shell rather slender, the aperture longer than the spire, the whorls five beside the nucleus; outline pointed-ovate, suture distinct, not impressed; sculpture of about 25 evenly distributed, spiral, punctate grooves with wider interspaces; the interspaces are flattened and polished, with transverse incremental rugæ; aperture rather narrow, the outer lip thin, so that the sculpture is reflected on the inner surface, anteriorly rounded and continuous, with a thin, short, arched pillar lip, carrying one well-marked plait, with a deep groove behind it; base with no trace of umbilicus. Longitude of shell, 8; of aperture, 5; maximum diameter of last whorl, 3.5 mm.

Habitat.—Pliocene sands of the Myakka River, Florida; one specimen collected by Mr. Joseph Willcox.

Type.—No. 113110, U. S. N. M.

This is a shell more slender than the average of the genus, but a good deal stouter than *A. fusulus*, from which it is otherwise readily discriminated by the evenly disposed spiral sculpture and the untruncate pillar.

RINGICULA SEMILIMATA, new species.

Shell minute, of three and a half whorls; spire about equal to the aperture; surface polished, suture distinct, not deep, the spire a little turrited and rather pointed; whorls smooth behind the periphery, in front of it evenly spirally grooved, with wider interspaces; aperture wide, with a thickened and reflected margin; outer lips slightly patulous and thickest at the middle; pillar with two strong plaits, the body with comparatively little callus, only the oldest and most callous showing a parietal denticle, the outer lip extending in front of the pillar, the canal in the adult very narrow and oblique. The size varies. Latitude, 1 to 1.2; longitude, 1.5 to 2 mm.

Habitat.—Chipola beds (2212, 2213), Calhoun County, and Alum Bluff beds, at Oak Grove, Santa Rosa County, Florida.

Types.—No. 113111, U. S. N. M.; also specimens in the collections of Mr. Aldrich and the Geological Survey of Alabama.

This species appears to be rather rare; it most nearly resembles *R. guppyi*. Dall, which is grooved all over and has a less slender spire.

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The parietal tooth in *R. guppyi* is rarely absent, even in specimens hardly mature; in *R. semilimata* only the very oldest and most calleus specimen shows any trace of it.

RINGICULA CHIPOLANA, new species.

Shell small, elevated, slender, faintly grooved all over, with four and a half whorls; spire about equal to the aperture, which is longer than wide, with a callous body-lip and reflected margin. Longitude, 2.2; maximum diameter, 1.4 mm.

Habitat.—Chipola beds (2211); in the lower bed at Alum Bluff, Chattahoochee River, Florida.

Type.—No. 113865, U. S. N. M.

This species is intermediate in size between *R. floridana* and *R. guppyi*, and is sculptured like them, but has the form of *R. semilimata*, especially the elevated spire, but with a proportionately narrower mouth. It differs from the very similar *R. biplicata*, Lea, by the absence of any denticles or liræ on the outer lip when mature.

TORNATINA INCISULA, new species.

Shell small, subcylindrical, slightly larger anteriorly, aperture as long as the shell; spire coiled in one plane, so that in profile only the small bulbous nucleus projects above the last whorl; surface smooth, hardly polished, marked only with incremental lines, and in some specimens with a few faint incised spiral lines about the base; suture deeply channeled, its margins produced and sharp, forming the posterior end of the shell, except for the minute globular nucleus which, when not lost, is quite conspicuous; whorls, about four, the last enveloping; aperture very narrow and deeply notched at the suture, anteriorly rounded, the thin, sharp outer lip passing insensibly into the short, stout, arched pillar, which is bounded on the left by a sharp groove, sometimes deepened to a chink, and carries a single, oblique, sharp plait; a thin callus covers the body, and the outer lip is somewhat produced in the middle. Longitude of shell, 5.5; maximum diameter, 2.5 mm.

Habitat.—Chipola beds (2211, 2212, 2213), Florida, where it is abundant.

Types.—No. 113867, U. S. N. M.; and in the collection of T. H. Aldrich.

This species is more slender than *T. canaliculata*, Say, and has the spire so coiled as to be invisible, and the sutural channel extremely deep and sharp-edged.

TORNATINA MYRMECOÖN, new species.

Shell small, long-ovate, of three and a half whorls beside the minute globular nucleus; surface smooth or marked only by faint incremental lines and microscopic spiral striæ; aperture slightly shorter than the

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spire; suture narrow, deeply channeled; spire just visible above the sutural margin, toward which the posterior part of the last whorl is evenly rounded over; aperture narrow behind, with a deep sutural notch, the outer lip gently arched in the middle, thin and sharp, then receding and gently rounded into the broad, conspicuous pillar, which is obliquely arched and chiefly constituted by a single broad plait; the body whorl is covered at the aperture by a thin layer of callus; there is no notch or chink behind the pillar; the anterior end of the shell is rounded and attenuated in the same degree as the other end. Longitude of shell, 6; maximum diameter, 3 mm.

Habitat.—Duplin County, North Carolina (2279, 2280), at the Natural Well and elsewhere.

Types.—Nos. 113874, 113875, U. S. N. M.

This pretty species is recognizable by the evenly rounded ends and gently inflated form, which are not duplicated in any other of our Miocene species.

TORNATINA PERSIMILIS, new species.

Shell small, short, subcylindrical, of about three whorls beside the nucleus, the spire moderately prominent, somewhat variable as usual in this group, the suture distinct, bordered by a narrow, shallow channel; aperture narrow behind, wider in front; outer lip thin, prominently arched, and very slightly constricted in the middle; in front, rounding gently into the pillar, which has a groove behind it, and is chiefly composed of a single not much arched nor very prominent plait. Longitude of largest specimen, 3; maximum diameter, 1.25 mm.

Habitat.—Chipola beds (2213), Calhoun County, Florida; a young specimen from Oak Grove, Santa Rosa County, Florida, also probably belongs to this species.

Types.—No. 112607, U. S. N. M., and in the collection of Mr. Aldrich

This species is the precursor and probably the ancestor of *T. canaliculata*, Say, which appears in the Chesapeake Miocene and persists to the present day. It differs from it in its smaller size and by its (on the average) more cylindrical shape, most of the specimens of *canaliculata* showing a tendency to be widest at the shoulder of the whorl. The Chipola specimens are more uniform than the ordinary *canaliculata*, yet if they occurred in the same faunal horizon might fairly be regarded as a dwarf race of that species.

TORNATINA FISCHERI, new species.

Shell small, ovate, rounded at both ends, spire almost concealed, of two and a half whorls; body slightly wider behind the middle of the shell; aperture as long as the shell, deeply notched at the suture, which is channeled, but whose outer margins arch over and nearly conceal the spire, probably closing altogether in some specimens; aperture narrow, rather contracted in front, the outer lip thin, arched in the direction of

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its growth and slightly incurved in the middle, sharp, anteriorly rounding into the short, spirally twisted pillar, which has a groove behind it and also a sharp, shallow groove on the plait, making it look double, though the distal end is single; the body shows a thin wash of callus; surface of the shell when perfect, brilliantly polished. smooth. Longitude, 2.5; maximum diameter, 1.25 mm.

Habitat.—Chipola beds (2213), Chipola River, Florida.

Types.—No. 113871, U. S. N. M., and in the collection of Mr. Aldrich.

The groove on the plait is a characteristic feature.

This species is named in honor of Dr. Paul Fischer, the distinguished author of the Manuel de Conchyliologie.

TORNATINA (CYLICHNELLA) GABBI, Dall.

Cylichnella ovum-lacerti, DALL, Trans. Wagner Inst., III, p. 15, 1890, *ex parte.*

Pliocene of the Caloosahatchie beds, Dall.

The reception by the National Museum of Mr. Guppy's collection of West Indian fossils has enabled a critical comparison to be made between the North American and Antillean fossils, which had been referred to his species. The result shows that the Pliocene shell differs from its Miocene forerunner, being larger, proportionately more slender, and somewhat more flaring at the base than the *T.* (*C.*) *bidentata*, Gabb and Orbigny. For this reason I propose for it the name of *Tornatina* (*Cylichnella*) *gabbi*. It reaches a length of 4.75 mm., and a maximum diameter of 2.5 mm.

TORNATINA (CYLICHNELLA) OVUM-LACERTI, Guppy.

Cylichna ovum-lacerti, GUPPY, Geol. Mag., I, p. 437, pl. XVIII, fig. 22, 1874.
Cylichnella bidentata, GABB, Proc. Acad. Nat. Sci. Phila., 1872, p. 273 (not pl. 10, fig. 2); Trans. Am. Phil. Soc., XV, p. 246, 1873.
Cylichnella bidentata, DALL, Blake Gastr., p. 46, 1889, *ex parte.*
Cylichnella ovum-lacerti, DALL, Trans. Wagn. Inst., III, p. 15, 1890, *ex parte.*
Not *Bulla bidentata*, ORBIGNY, Moll. Cuba, p. 125, pl. IV, figs. 13–16, 1841.

In my Blake report I followed Gabb in referring his Santo Domingo *Cylichnella bidentata* to the *Bulla bidentata* of Orbigny. It appears, however, that Gabb's Santo Domingo fossils are not identical with the species described by Orbigny, though the latter are also found fossil in our Miocene and Pliocene, both in the Chesapeake Miocene of Virginia, where it was described under the name of *Bulla biplicata* by Lea, and in the Chipola Miocene of the Alum Bluff beds, on the Yellow River at Oak Grove, Santa Rosa County, Florida.

The Santo Domingo fossil is a much larger and proportionately stouter shell and more distinctly spirally grooved all over, Orbigny's shell being often grooved only near the base. Gabb's shell measures 4 mm. long and 2 mm. in diameter; Orbigny's 3 mm. long by 1.25 mm. in diameter. For the former, Guppy's name must be adopted.

Gabb's types are in the Academy of Natural Sciences at Philadelphia; the National Museum possesses specimens (No. 113746) from Potrero, Rio

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Amina, Santo Domingo, and the types of Mr. Guppy. It may be added that the figure given by Gabb in 1872 is not taken from one of his own specimens, but is a bad copy of one of Orbigny's figures, with the spiral striation drawn as if it ran obliquely. The Pliocene specimen referred to *C. ovum-lacerti* by me in 1890, when compared with Guppy's original, proves to be a larger and more slender shell, which will require a separate name.

RETUSA CHIPOLANA, new species.

Shell elongate-pyriform, posteriorly attenuated, smooth, except for lines of growth; spire sunken, with a small perforation over it; aperture very narrow, except in front, as long as the shell, produced behind the suture at the margin of the apical pit; outer lip thin, straight, rounded insensibly into the pillar in front; pillar lip simple, thin, reflected, with a groove behind it; body with little or no callus. Longitude, 5.5; maximum diameter, 2.25 mm.

Habitat.—Chipola beds (2213), on the Chattahoochee, and also at Oak Grove, on the Yellow River.

Types.—No. 113879 U. S. N. M., and in the collection of Mr. Aldrich.

SCAPHANDER LANGDONI, new species.

Shell small, rather slender for the genus, with the spire concealed and covered by a small, rather shallow pit; aperture wide, as long as the shell, with a wide sutural sinus, a straight outer lip, gradually rounded into the pillar in front; pillar simple, solid; body with little or no callus; surface polished, transversely marked by lines of growth and frequently by small, narrow, parallel waves, stronger toward the middle of the whorl; spiral sculpture of fine, rather distant, punctate, incised lines, uniformly disposed, but varying somewhat in different specimens; there is no constriction of the whorl in front of the sutural keel and no groove behind the pillar, the axis is widely pervious, revealing the spire. Longitude, 13; maximum diameter 6.5 mm.

Habitat.—Chipola beds (2211, 2213).

Types.—Nos. 113883, 113884, U. S. N. M.; also in the collection of Mr. Aldrich.

This species is more attenuated behind than *S. primus*, Aldrich, and less so than the recent *S. watsoni*, Dall; in proportions and sculpture and combination of characters this little species does not appear to agree closely with any of those previously known from the region. It is named in honor of Mr. D. W. Langdon, lately of the State survey of Alabama, and to whom are due the first section of the Alum Bluff locality and the discrimination of the Chattahoochee group of rocks.

ATYS ŒDEMATA, new species.

Shell small, inflated, rapidly attenuated in front and behind, periphery prominent; aperture as long as the shell, extending behind the

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inner lip and descending, with a twist, upon the apical region of the concealed spire; the shell is sharply constricted just in front of the apex, and the vortex thus included is swollen and strongly transversely wrinkled; surface of the shell polished, spirally grooved toward each end, smooth toward the periphery; aperture rather narrow, somewhat angulated at both apices; pillar straight, reflected, with a narrow groove behind it; outer lip thin, simple. Longitude, 4.5; maximum diameter, 2.5 mm.

Habitat.—Chipola beds (2213), Chipola River, Florida.

Types.—No. 113889, U. S. N. M., and in the collection of Mr. Aldrich.

It is probable that all the specimens which have served for this description are immature, but it is quite certain they are not the young of any species of *Atys* now known from our Tertiary.

ATYS (ACROSTEMMA) GRACILIS, new species.

Shell small, slender, with the aperture longer than the body, which is obscurely enlarged about the middle, slopes biconically from this girdle above to the apex and below to the region just behind the upper end of the pillar, from whence it is more rapidly attenuated to the anterior end of the shell; spire sunken, the pit varying in size in different specimens, the margin slightly thickened and transversely striated; middle of the whorl smooth, but the distal portions more or less distinctly spirally grooved; the lines of growth are feeble; aperture narrow, especially behind, where it is a good deal produced above the apex, with its inner lip slightly twisted; in front the pillar is twisted and faintly grooved, with a shallow chink behind it; in front it is obscurely obliquely truncate where it joins the anterior curve of the outer lip. Longitude 5; maximum diameter, 2 mm.

Habitat.—Chipola beds (2211, 2213).

Types.—No. 113892, U. S. N. M., and in the collection of Mr. Aldrich.

M. Cossmann notes that this section forms a passage, as it were, from *Cylichna* to *Atys*, but it would seem to the writer that it is more nearly related to the latter, and should rank as a section of *Atys* rather than of *Cylichna*.

ATYS (ACROSTEMMA SALINA, new species.

Shell small, rather slender, involved, with a polished surface, and the aperture produced in a point behind the spire; body of the shell wider anteriorly; sculpture of fine incised lines, closer and more numerous anteriorly, becoming sparse about the middle of the shell, and nearly absent toward the spire, except at the extreme end; surface otherwise smooth, except at the posterior end, where close-set, straight, sharp, rather deep axially directed grooves extend from the apex forward about one-fifth the length of the shell; aperture narrowest in the middle; outer lip axially straight, incrementally somewhat arched, behind produced beyond the spire to a rather narrow point, whence it returns with a twist on the body, covering the apical region with a rather

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thick mass of callus, which is much thinned anteriorly; pillar thin, solid, arched, with a narrow, long chink behind it; aperture rounded in front; outer lip thin, sharp-edged, simple. Longitude of shell, 4.5; maximum diameter, 1.5 mm.

Habitat.—Lower Eocene, Lisbon horizon, at the head of Saline Bayou, St. Maurice. Winn Parish, Louisiana. collected by Johnson (station 2005).

Type.—No. 106971, U. S. N. M.; received from U. S. Geological Survey.

This species is remarkable for the combination of characters ordinarily regarded as subgeneric or sectional. It has the form of *Bullinella*, but the posterior extension of the aperture is narrowed to a rounded point, the spire is concealed, not marked by any pit or perforation, but covered by a short, thick mass of callus; finally, the shell is very narrowly umbilicate, with a slender, arched, unplicate pillar, twisted, but without the short, strong twist of typical *Atys*. When fully developed the fringe-like grooved area at the apical end is a strongly marked character.

ATYS OBSCURATA, new species.

Shell small, wider than *A. gracilis*, and differing from it in having the lateral profile evenly curved, so that no indication of the equatorial swelling is visible in it; the aperture is proportionately wider and less produced behind, the inner lip above the spire is more strongly twisted; there is a shallow pit, but no perforation, at the spire, nor is there any thickened striated rim at the margin of the pit; the spiral grooving, though similarly distributed, is rather sharper than in *A. gracilis*, and the pillar less obviously twisted; it is obliquely truncate, narrow, and has behind it a narrow but obvious groove. Longitude, 4; maximum diameter, 2 mm.

Habitat.—Lower bed at Alum Bluff (2211) and the Miocene marl of Bowden, Jamaica (Bland).

Types.—Nos. 61563, 113893, U. S. N. M.

Only two specimens were obtained at Alum Bluff, but the species does not seem to stand in with any of the others. It is a typical *Atys*, and not an *Acrostemma*.

RETUSA (CYLICHNINA) DECAPITATA, new species.

Shell small, subcylindrical, smooth, except for lines of growth, generally polished, with a few revolving striæ on the base; spire sunken, perforate, below a very shallow pit with the edge more or less rounded over; aperture as long as the shell, narrow; the outer lip sharp, simple, straight, with a deep sutural sinus and anteriorly receding and then rounding imperceptibly into the pillar; pillar twisted, obscurely ridged, with a minute chink behind it; the body with a thin wash of callus. Longitude, 5.25; maximum diameter, 2 mm.

Habitat.—Chipola beds (2213).

Types.—Nos. 113886, U. S. N. M., and in Mr. Aldrich's collection.

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This species is very close to the recent *Cylichna verrillii*, Dall, from which it is only distinguished by having the posterior commissure of the aperture more produced and the shell a trifle more evenly cylindrical toward the apex.

RETUSA (CYLICHNINA) QUERCINENSIS, new species.

Shell small, resembling *C. decapitata*, but smaller, more solid than *C. decapitata* of the same size, and proportionately a good deal shorter, the apical pit wider, the posterior commissure of the aperture less produced, the pillar shorter and more oblique and twisted, and with a more distinct furrow behind it; the young *C. decapitata* is attenuated anteriorly, but the *C. quercinensis*, which is evidently adult, is not so; the anterior spiral striation is barely perceptible with a glass. Longitude, 2.5; maximum diameter, 1.25 mm.

Habitat.—Alum Bluff beds, at Oak Grove, Yellow River, Santa Rosa County, Florida, L. C. Johnson.

Type.—No. 131528, U. S. N. M.

This species is small, but can not be referred to the young of any of the other species known from the region.

RETUSA (CYLICHNINA) DUPLINENSIS, new species.

Shell cylindrical, surface marked with lines of growth, which are slightly elevated where they pass over the ridge into the apical perforation, and with fine spiral striæ, which on and near the base are alternated with sharper grooves; aperture narrow, as long as the shell; the outer lip straight, behind but little produced, and moderately receding to the suture; in front the outer lip recedes and joins the pillar evenly; pillar very oblique, strong, with an obscure plait, a small chink behind the anterior end; body short, with a little wash of callus; apex of the shell gently rounded over to a cylindrical perforation, with little or no funicular border. Longitude, 6.75; maximum diameter, 2.5 mm.

Habitat.—Carolinian marl, at the Natural Well, Duplin County, North Carolina (2279), Burns.

Type.—No. 113876, U. S. N. M.

This species differs from C. *decapitata* by its greater stoutness, the absence of a funicle on the spire and most obviously by its stronger, more oblique, and differently plaited pillar. The latter character also separates it from C. *verrillii*, which differs further in having a well-marked funicle around a proportionally small perforation.

RETUSA (CYLICHNINA) MICROTREMA, new species.

Shell small, slender, somewhat roundly pointed at both ends, smooth except for lines of growth; body whorl, except distally, quite cylindrical; aperture narrow, little produced behind, recurved directly into the apical perforation without funicular fasciole or decided notch; body with a slight wash of callus; pillar nearly straight, not twisted,

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without perceptible keel or plait, and with only the merest trace of a groove behind it; outer lip straight. Longitude, 3.2; maximum diameter, 1 mm.

Habitat.—Natural Well, Duplin County, North Carolina (2279).

Type.—No. 113887, U. S. N. M.

This species only fails of being a *Volvula* by having a subcylindrical perforation in the place of a projecting point. I have not seen anything like it in the recent fauna.

Genus BULLINA, Férussac.

Bullinula, BECK; type, *Bullina scabra*, GMELIN + *lineata*, GRAY.

Section ABDEROSPIRA, Dall.

In the typical *Bullina* the spire is exposed or even elevated; in the fossil about to be described the apex of the spire is hidden, as in *Bulla*, and marked only by a perforation. This difference seems worthy of sectional discrimination. Type *B.* (*A.*) *chipolana*, Dall.

BULLINA (ABDEROSPIRA) CHIPOLANA, new species.

Shell small, ovate, strongly sculptured, umbilicated, with a perforate apex and hidden spire; surface sculptured with numerous sharp spiral grooves with wider polished interspaces, crossed by distinct, equally spaced incremental lines, more feeble on the interspaces, but reticulating or punctuating the grooves; aperture as long as the shell; outer lip axially nearly straight, incrementally slightly arched, thin, with a simple edge and smooth internal surface; posterior sinus with a moderate notch, anterior end rounded; pillar thin, emarginate, with a deep groove behind it, outside of which is a well-marked ridge bounding a narrow, but deep umbilicus; body with a thin wash of callus; apex perforate, much as in *Bulla striata*. Longitude, 4.5; maximum diameter, 3 mm.

Habitat.—Chipola beds (2213), Chipola River, Florida, collected by Burns; and near Gatun, Isthmus of Darien, by Rowell.

Types.—No. 113894, U. S. N. M.; and in Mr. Aldrich's collection.

HAMINEA POMPHOLYX, new species.

Shell small, thin, subglobular; widest behind the middle; surface marked with fine incremental lines and spiral striæ, hardly visible except under a glass; apex impressed, aperture wide, outer lip thin, arched axially and incrementally, receding in front and imperceptibly merging with the oblique, slightly thickened, twisted pillar, which from below is pervious; body with a thin wash of callus; shell slightly narrowed in its anterior third. Longitude, 6.5; maximum diameter, 5.5 mm.

Habitat.—Chipola beds (2211, 2213), Florida.

Types.—Nos. 113895–113897, U. S. N. M.; and in the Aldrich collection.

This species is shorter and more globose than any of the recent forms of the coast.

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Genus TEREBRA, Bruguiére.

This genus is one of the most difficult to handle from the inexhaustible tendency to variation the species exhibit, and which renders it frequently almost impossible to come to any satisfactory conclusion as to the relative rank and permanency of the mutations exhibited. Our east American fossil species may be arranged in three series; *Terebra* proper, with large, strong shells, the pillar with a single strong anterior keel; *Hastula*, Adams, with the pillar smooth, the canal straight, and the subsutural band absent, feeble, or not set off by a sulcus; *Acus* Adams, with the band and sulcus more or less distinct, a tendency to reticulated sculpture, and the pillar with a flat callus at the aperture, which usually bears farther back two more or less distinct plaits or keels. The two latter may be regarded as subgenera. It is proper to observe that nearly all the diagnoses of the groups in Terebridæ contain a proportion of error in matters of fact. This is especially the case with *Hastula* and *Acus*, Adams, whose arrangement is so generally followed.

In the Eocene we have *T.* (*Hastula*) *venusta*, Lea, of which *T. perlata*, Conrad, *T. mitis*, de Gregorio, and *T. inula*, de Gregorio, are synonyms or mutations; *T. houstonia* (Harris, MS.), new species; and *T.* (*Acus*) *polygyra*, Conrad, of which *T. andrega* and *T. ignara*, de Gregorio, are mutations. These species are all Claibornian, or older. In the later Eocene of Vicksburg we have *T.* (*Acus*) *divisura*, Conrad, and its variety or mutation *T. mirula*, de Gregorio, and *T.* (*Acus*) *tantula*, Conrad, which extends up into the older Miocene of Haiti, the Orthaulax bed at Tampa, Florida, and the Alum Bluff beds at De Funiak Springs.

In the Miocene the genus is more numerously represented. Typical *Terebra* appears in the Haitian old Miocene, which contains *T. gabbii*, Dall (*robusta*, Gabb, not of Hinds), and *T. haitensis*, Dall, new species. In the Chesapeake Miocene we have the *T. unilineata*, Conrad, a well-marked species.

Acus is represented in the old or Chipola Miocene by *T. curvilineata*, new species, from Shiloh, New Jersey, and Easton, Maryland; *T. bipartita*, Sowerby (1849, not of Deshayes, 1859), *T. sulcifera*, Sowerby, *T. inæqualis*, Sowerby, and *T. langdoni*, Dall, new species, all of which are common to Haiti and the Floridian Chipola beds; also *T. perpunctata*, Dall, new species, and *T. chipolana*, Dall, new species, of the Chipola beds. Later species of *Acus* are *T. dislocata*, Say (*indenta*, Conrad, *ex parte*, *indentata*, Meek, by a typographical error, and *ziga*, de Gregorio), which extends from the Chesapeake Miocene to the recent fauna; *T. carolinensis*, Conrad, of the newer Miocene, at the Duplin Natural Well, North Carolina; *T. emmonsi*, Dall (*neglecta*, Emmons, 1858, not of Michelotti, 1847), of the Carolinas; *T. concava*, Say, ranging from the newer Chesapeake Miocene to the recent fauna, and *T. proterta*, Conrad, from the Pliocene to the recent fauna; *T. curvilirata*, Conrad, and *T. poly-*

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gonata, new species. *Hastula*, both fossil and recent, has few American species. *T. evansi*, Gabb, in the older Miocene of Chiriqui, Central America, seems to be an analogue of *T. simplex*, Conrad, of the Chesapeake Miocene of Maryland. The latter is abundant in the beds of St. Mary's River, where it is accompanied by a variety *altior*, Dall, and by a small, smooth species common to the older beds at Shiloh. New Jersey, for which the name *inornata* is proposed.

In early publications on our Tertiary, species were sometimes described as *Terebra* which should now be referred to other families. Such are *T. costata*, I. Lea, 1833 (not of Borson, 1823, + *leai*, de Gregorio), *T. gracilis* and *T. multiplicata*, I. Lea; and also *T. clavula* and *constricta*, H. C. Lea, which belong to the Cerithiacea. There are also a number of catalogue names or synonyms, such as *T. perlata*, Conrad (= *venusta*, Lea); *T. petitii*, Kiener (= coarse var. of *T. dislocata*); *T. loxonema*, Conrad (probably intended for one of the varieties of *T. simplex*, but never described or figured); *T. sublirata*, Conrad (a catalogue name here revived), and *T. tuberculosa*, Nelson (unfigured, 1870) which is not the *tuberculosa* of Hinds (1843).

TEREBRA (HASTULA) HOUSTONIA, Harris, new species.

This species differs from *T. venusta* by its less rectilinear sides, its more inflated whorls, and drawn-out spire of somewhat pupiform appearance, its straight and simple pillar, its more arched longitudinal riblets, which are usually obsolete on the last whorl, and by its feebler spiral striation. Longitude, 29; maximum diameter, 5 mm., in a specimen having ten whorls beside the smooth, small, pointed nucleus of three and one-half whorls.

Types.—No. 6034, U. S. N. M.; Claiborne, Alabama.

The species will be fully described and illustrated by Mr. G. D. Harris in his report on the Texas Tertiary fauna. It is found in the lower bed (Lisbon horizon) at Claiborne Bluff, and also in the Texas Eocene.

TEREBRA GABBI, Dall.

Terebra robusta, GABB, Geol. Santo Domingo, p. 224, 1873; not of HINDS, Proc. Zool. Soc., Lond., p. 149, 1843.

Shell large, strong, with a slender, strongly sculptured spire, and later smoother, rapidly enlarging whorls, with a nearly peripheral, narrow, spiral color band, which, even in the fossil, sometimes is clearly perceptible; on the earlier whorls the upper half is occupied by a wider sutural and an anterior narrower elevated band, separated from each other by a well-marked sulcus; they are crossed obliquely by fine, sharp, regularly spaced elevated lines with wider interspaces, which on the rest of the whorl have a vertical or axial direction to the suture; in the specimen before me about a dozen (partly decollate) whorls exhibit this sculpture, the whole shell being microscopically spirally striated; the sculpture then becomes obsolete, the following four whorls being

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nearly smooth, except for incremental lines, while they rapidly become more rounded; suture distinct; aperture with the outer lip somewhat receding in the middle; inner lip moderately callous; pillar half a turn inside the aperture showing a prominent basal keel; canal twisted, with a distinct fasciole. Diameter of spire at decollation, 2.75; maximum diameter of twelfth subsequent whorl, 24; longitude of (decollate) shell, 70 mm.

Habitat.—Older Miocene of Santo Domingo at the Potrero, River Amina, Bland; Gabb, various localities on the same island.

Types.—No. 113751, U. S. N. M.; and in the Academy of Natural Sciences, Philadelphia.

This species has hardly more in common with the Pacific *T. robusta*, Hinds, than the fact that the sculpture is obsolete on the later whorls. It grows much larger than the dimensions given above, and the last whorls become much swollen.

TEREBRA HAITENSIS, new species.

Shell slender, acute, all the whorls sculptured, the early whorls with a double subsutural band, as in the last species, but with the riblets crossing the wider band vertically, becoming oblique on the anterior band, where they are almost nodulous, and forming arched waves on the rest of the whorl to the suture, but becoming suddenly obsolete at about the line of revolution of the suture and thence over the base to the canal; aperture rather short; pillar short, twisted, with a single basal keel, which falls short of the aperture; canal short, sharply recurved; spiral striation obsolete or none. In a specimen of 24 whorls, excluding the nucleus, the total length is 62, the maximum diameter 11.5 mm.

Habitat.—Older Miocene of Santo Domingo at the Potrero, River Amina, Bland; Gabb, various localities on the same island.

Type.—No. 113753, U. S. N. M.

This species differs from the preceding by not losing its slender form, by preserving its sculpture, by details of the sculpture, and by its more numerous whorls in the same length.

TEREBRA (HASTULA) INORNATA, new species.

Shell small, slender, nearly smooth, without any sutural band or spiral sculpture, and with about a dozen whorls; early whorls with a few obsolete transverse riblets, other whorls with no sculpture except the somewhat irregular incremental lines; whorls rather flat, suture distinct, closely appressed; aperture longer than wide; outer lip thin, nearly straight, simple; pillar short, simple, twisted; the canal moderately wide; base rounded, without a carina. Longitude, 18; maximum diameter, 4 mm.

Habitat.—Older Miocene of Shiloh, New Jersey, and St. Mary's River, Maryland; collected by Burns and others.

Types.—Nos. 106953–106955, U. S. N. M.

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A single specimen was found with the fossils from the lower bed at Alum Bluff (2211), but as some St. Mary's fossils had been standing close by on the same table before sorting I believe that this single specimen is probably an estray. The species is readily recognizable and most nearly allied to the slender form of *T. simplex*, Conrad, found in the same bed at St. Mary's River, but which may be distinguished by its more conical form and larger size when adult. The name of *inornata* was applied by Professor Whitfield to the New Jersey form in his report on the Gastropods of the Miocene marls of New Jersey.[1] It is still more abundant in Maryland, and as the specimens do not appear to differ in any essential way, I adopt Professsor Whitfield's name for the species.

TEREBRA (ACUS) POLYGYRA, Conrad.

Terebra polygyra, CONRAD, Journ. Acad. Nat. Sci. Phila., VII, p. 156, 1834.

This form, described from Claiborne by Conrad, was not figured by him, and seems to have been forgotten both by Conrad and Meek in making up their check lists. It has since been redescribed by de Gregorio, who has figured it as *T. andrega*, and probably as *T. ignara*. It is a small shell, prefiguring *T. divisura*, Conrad, from the young of which it can hardly be distinguished, except as more slender. I have thought it well to direct attention to it, as it is clearly distinct from *T. venusta*.

TEREBRA (ACUS) TANTULA, Conrad.

This species, described from the Vicksburgian Eocene, appears also in the older Miocene of Santo Domingo, of the Tampa Orthaulax bed, and of the Alum Bluff beds at De Funiak Springs, Florida. It may be distinguished from *T. polygyra* and other similar species by its spiral striation.

TEREBRA (ACUS) CURVILINEATA, new species.

Shell acute-conic, solid, with 12 to 14 moderately convex whorls; early whorls more flatsided, with numerous narrow, transverse, slightly waved riblets, extending from suture to suture, with about equal interspaces; suture very distinct; sutural band formed by a vaguely limited constriction, not a groove; a short distance in front of the suture the ends of the ribs thus delimited from the rest have a tendency to coronate the whorl; on the later whorls the ribs become less regular and somewhat less prominent; aperture longer than wide; outer lip simple; pillar elongated, twisted, smooth; siphonal fasciole very distinct. Longitude, 27; maximum diameter, 9.5 mm. in a specimen of 14 whorls.

Habitat.—Older Miocene of Jericho, New Jersey, and Easton, Maryland, Burns and Harris. The specimens from Maryland are larger and in better preservation than those found in New Jersey.

Types.—Nos. 106952, 111648, U. S. N. M.

[1] Moll. and Crust. Mioc. N. J., p. 114, pl. xx, figs. 11–13, 1894.

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The name *curvilineata*, by a typographical error, appears in Meek's Miocene check list for *T. curvilirata*, Conrad, a species from St. Mary's River, Maryland; but it has never been applied to any described species from our Tertiary heretofore. The species has something in common with the more rugose specimens of *T.* (*Hastula*) *simplex*, Conrad, but is perfectly distinct.

TEREBRA (ACUS) CURVILIRATA, Conrad.

Terebra curvilirata, CONRAD, Proc. Acad. Nat. Sci. Phila., I, p. 327, 1843.

This is an old species of Conrad's, which does not appear to have been figured. The shell is small, not exceeding 30 mm. in length, with rather swollen whorls constricted narrowly above, much as in *Pleurotoma* of the section *Cymatosyrinx*. The ribs are about 12 to the whorl and most prominent at the periphery; their posterior ends are constricted off near the suture without any distinct groove or incised line; they are strongly curved in front of the constriction; the surface has extremely faint, obsolete spiral sculpture, only visible with the aid of a lens; the pillar thin, simple, and twisted, rather short; the nucleus is conical, of four smooth whorls like a small, very much elevated *Calliostoma*, except that the whorls are rounded. A specimen 15 mm. long had ten whorls, exclusive of the nucleus, and a maximum diameter of 4.75 mm.

Habitat.—Miocene of St. Mary's River, Maryland. Types in Academy of Natural Sciences; specimens in U. S. National Museum (Nos. 106956, 106957).

TEREBRA (ACUS) SINCERA, new species.

Shell small, thin, acute-conic, flat-whorled, with feeble sculpture; whorls ten, without the nucleus; anterior half of the whorls, with fine, feeble, spiral threading overrunning the ribs, posterior half without spirals, but divided into two equal parts by a spiral groove visible between the ribs; transverse sculpture of fine, low, even, narrow, arched riblets, with wider interspaces, extending clear across the whorls; suture distinct, sutural band obscure, not swollen; aperture longer than wide, outer lip thin, arched in harmony with the ribs; pillar short, smooth, or faintly excavated; canal recurved, not contracted. Longitude, 22; maximum diameter, 5 mm.

Habitat.—Miocene of St. Mary's River. Maryland.

Types.—No. 11873 *a*, U. S. N. M.

This species is quite distinct from the others of the St. Mary's horizon, and when perfect is easily recognized. When superficially eroded the ribs are more prominent, as is the succeeding whorl at the suture, and the whorls may have a slightly turrited appearance.

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TEREBRA (ACUS) BIPARTITA, Sowerby.

Terebra bipartita, SOWERBY, Quart. Journ. Geol. Soc. London, VI, pt. 1, p. 47, 1849. Not = *T. bipartita*, DESHAYES, 1859.

Habitat.—Old Miocene of Santo Domingo, at Ponton, and in the Chipola beds (2213), Calhoun County, Florida. Specimens in the Academy of Natural Sciences and the U. S. National Museum (Nos. 113653, 113910).

Variety *bipartita*, s. s.—Shell acute, with the sutural sulcus prominent and set off by a deep sulcus, which cuts ribs and all, from the rest of the whorl, where the spiral threading is remarkably clear-cut, uniform, and elegant, not overriding the narrow, sharp-edged ribs. Santo Domingo and Chipola. Longitude, 23; maximum diameter, 5.5 mm.

The pillar of this form seems to be simple and smooth in all the specimens I have seen.

Variety *spirifera*, Dall.—Shell with the ribs feeble, the spiral sculpture more prominent than the ribs, especially two rather narrow spirals just in front of the sutural band, and overriding the ribs with close-set, even, distinct, coarse, rounded threads, which fail on the canal; pillar distinctly grooved or biplicate. Longitude, 30; maximum diameter, 8 mm. Ponton, Santo Domingo.

This form is larger, and the shell increases in diameter more rapidly than in the type. It may prove to be worthy of specific rank with more material, in which case the varietal may be used as a specific name. No. 113654, U. S. N. M.

It recalls, in its relation to the type, the relation of *T. indenta*, Conrad, to *T. dislocata*, Say.

Variety *oligomitra*, Dall.—Shell slender, with 12 or more whorls, crossed by numerous very sharp, thin, sigmoid ribs, with wider interspaces, over which lie (between the sutures four and on the base four smaller) strap-like, flat spirals, with much wider interspaces, failing on the pillar; the whole surface is also finely spirally striate; the pillar long, twisted, biplicate; the suture very distinct. Longitude. 38; maximum diameter, 8.5 mm. River Amina, Santo Domingo.

This form is more slender, the spirals are sparse and strap-like, instead of crowded and rounded; the fine spiral striation is not seen on the previously mentioned forms. No. 113756, U. S. N. M.

Variety *cirrus*, Dall.—Shell much smaller and proportionally more slender; spirals flat, strap-like, irregular, with narrower interspaces, overrunning very low and narrow sharp ribs with wider interspaces; whorls, 12 or more, flattish; pillar sharply biplicate. Longitude, 25; maximum diameter, 5.5 mm. River Amina, Santo Domingo. No. 113752, U. S. N. M.

This bears to the variety *oligomitra* much such a relation as *T. proterta*, Conrad, does to the more delicate types of *T. dislocata*, Say. It may prove to be worthy of specific rank.

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The preceding varieties would by most writers be regarded (and with some reason) as species, but the differences they exhibit are for the most part such as I find between the different races of *T. dislocata*, when a sufficient geographic series is compared. In the absence of large suites of the Santo Domingo fossils, it seems more prudent for the present to assign them varietal rank.

TEREBRA (ACUS) AMITRA, new species.

Shell small, acute, slender, of 10 whorls without the nucleus; whorls flattish, crossed by about 17 prominent, straight, rounded, even ribs with slightly wider interspaces; spiral sculpture of sparse, sharp, incised lines, more numerous and closer on the base, eight or nine in all; sutural band absent, or not set off by sulcus or constriction; aperture longer than wide, outer lip straight incrementally; canal wide; pillar straight, smooth, with its anterior edge prominent; canal short, wide; siphonal fasciole distinct. Longitude, 9.5; maximum diameter, 2.5 mm.

Habitat.—Potrero, River Amina, Santo Domingo.

Type.—No. 113755, U. S. N. M.

This little species, though represented by only a single specimen, seems clearly distinct.

TEREBRA (ACUS) LANGDONI, new species.

Shell small, slender, of 13 whorls beside the nucleus, which is small, conical, and of three whorls; sculpture reticulated transversely by 16 low, narrow, rounded, slightly flexuous ribs, with wider interspaces, the posterior ends of the ribs not cut off by the deep sulcus which defines the sutural band in front; transverse sculpture of this sulcus visible between the ribs, and four flattish spirals, separated by narrower grooves, between the sulcus and the next suture, and seven or eight narrower spirals on the base; aperture longer than wide; pillar simple, smooth; canal rather long, twisted and recurved. Longitude, 20; maximum diameter, 4 mm.

Habitat.—Chipola beds (2211, 2212, 2213), Calhoun County, Florida, Burns.

Type.—No. 113913, U. S. N. M.

Variety *perpunctata*, Dall. Shell with the spiral sculpture replaced by fine spiral striæ, obsolete or irregular, except the sulcus in front of the sutural band, which is represented between the ends of each pair of ribs near the suture by a deep, generally rounded, puncture or pit. Found with the type in the Chipola beds (2213).

This well-marked and rather abundant little species is dedicated to Mr. D. F. Langdon, late of the Alabama State geological survey.

TEREBRA (ACUS) CHIPOLANA, new species.

Shell small, slender, obsoletely sculptured, with a pupoid nucleus of four whorls and about a dozen subsequent whorls, the earlier of which

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are slightly smaller than the last two nuclear turns; sides flattish, suture distinct; sutural band conspicuous, set off by a deep sulcus; the band is without nodules or marked sculpture, except on the last whorl; the whorls are feebly transversely wrinkled by obsolete riblets, which on the last whorl in the type specimen take a more definite shape, but fade out on the periphery; spiral sculpture of obsolete grooves on the anterior half of the whorl, two of which on the base are more distinct than the others; aperture longer than wide; pillar simple, smooth, twisted, little recurved; siphonal fasciole with a sharp posterior keel. Longitude, 12; maximum diameter, 2.5 mm.

Habitat.—Chipola beds (2213). A single specimen (No. 113912) in the National Museum.

This little species is sufficiently unlike the others to require but little in the way of comparison. A dwarf *T. langdoni* var. *perpunctata*, with the ribs almost wholly obsolete and the sulcus continuous instead of broken into punctures, would be something like it.

TEREBRA (ACUS) NEGLECTA, Emmons.

Terebra neglecta, EMMONS, N. C. Geol. Surv., p. 258, 1858.

This unfigured species appears to have been lost sight of, though apparently well characterized. At first sight it would recall *T. dislocata*, but on inspection it is found to differ materially. The sutural band is marked in front by a constriction, not a sulcus, toward which the transverse sculpture becomes obsolete, while the front part of each whorl is somewhat swollen, with the ribs strongest on the periphery. In many specimens the ribbing on the sutural band alternates with that on the whorl. The posterior half of the whorl is smooth or only faintly spirally striated; on the anterior half the spirals, though fine and close, are well marked. The pillar is smooth and without plaits, while in *T. dislocata* it is biplicate. The shell reaches about 32 mm. in length and 7.5 in maximum diameter, with 15 whorls. The taper of the tip of the spire is more rapid than the rest, instead of being uniformly conical. It was described by Emmons from the Miocene of North Carolina, but was not found by Burns in the Duplin beds. We have it in the National Museum (No. 11461) from the Chesapeake Miocene (1521) of South Carolina, on the authority of Whitfield.

TEREBRA (ACUS) DISLOCATA, Say; var. INDENTA, Conrad.

Terebra dislocata (SAY) CONRAD, Sill. Am. Journ. Sci. XLI, p. 343, 1841.
Terebra indenta, CONRAD, Proc. Acad. Nat. Sci. Phila., 1862, p. 565, 1863.
Terebra indentata, MEEK, Miocene check list, p. 18, No. 603, 1864.

Habitat.—Duplin beds at the Natural Well, Duplin County, North Carolina.

The species *T. dislocata* in the Miocene has some varieties which are not reproduced in the recent fauna, as well as some that are. Of the former, *T. indenta*, Conrad (*indentata* of Meek by a typographical error), is the most marked. It differs from the typical *T. dislocata* by its feebler and closer transverse sculpture, and its stronger, close-set, cord-like

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spirals, which are more conspicuous than the riblets which they overrun. In full-grown specimens the diameter of the base is proportionately greater than in *T. dislocata*, and the surface is less polished. The young *T. indenta* resemble an exceptionally stout *T. protexta*, Conrad. The variety, which, when well developed, often seems perfectly distinct from typical *T. dislocata*, nevertheless grades insensibly into the latter in a large collection from one locality, and it can not be regarded as a mutation of more than varietal rank.

Genus CONUS, Linnæus.

The species of this genus are separated when belonging to the recent fauna largely by their color-pattern, and in the absence of this aid they are doubly difficult to discriminate. In general the rule that local faunæ are derived from preexisting faunæ of the same general region is a good guide, and a careful comparison of the fossils with the recent types will often assist materially in determining the relations of fossil forms. The identifications which travel to distant faunæ for representatives—as, for instance, the Indo-Pacific fauna for Haitian fossils—are usually wrong, and all Gabb's identifications of this sort will be modified by further and more careful study. Analogous characteristics are often purely dynamic in forms of different lineage, subjected to similar conditions in widely distant localities. Where modern faunæ differ in the races of any genus which they contain, the antecedent fossils in the same regions are not likely to be much more nearly related.

The Mediterranean and African cones belong to groups which are not effectively represented in American waters; hence it is probable that none of the identifications of American with European Tertiary cones have the weight of probability in their favor. The same type may be represented in both faunæ, but this is only exceptionally the case, and is not to be taken for granted.

In de Gregorio's useful but rather slipshod work on the Alabama Eocene fossils the common *Conus sauridens* of Conrad is referred to *C. diversiformis* of Deshayes, an Eocene cone of the Parisian basin. They are in fact very similar species, but if identical, *C. sauridens*, being the older name, must be applied to the French species and not the French name to the American species. I think, however, the two species are not identical. *C. diversiformis* is a much thinner and lighter shell, with a proportionally wider aperture, and does not show the remarkable plait at the end of the pillar, the formation of which announces maturity in *C. sauridens*. The latter species, though rather rare at Claiborne, is only varietally separated from the Jacksonian *C. tortilis* and the Vicksburgian *C. alveatus*, while the old Miocene *C. planiceps*, Heilprin, forms the culmination of the series. Very young *C. sauridens* (like many other immature cones) show small nodules at the shoulder or just below it; these are the *C. parvus*, H. C. Lea. *C. protractus*, Meyer, and *C. pulcherrimus*, Heilprin, with a probably new

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but undescribed form from Vicksburg, complete the list of our known Eocene cones. *C. gyratus*, Morton, and *C. claibornensis*, Lea, are unrecognizable, and should be dropped. *C. subsauridens* does not appear to differ from *C. sauridens*, Conrad. *C. granopsis*, de Gregorio, appears to be identical with *C. protractus*, Meyer, but the type of *C. granopsis* is only 4 mm. long, and it may be a young *C. sauridens*. *C. improvidus*, de Gregorio, from an unmentioned (American?) locality, is not like anything known from Claiborne in American collections.

Only three species of cones are yet known from the Chesapeake Miocene: *C. adversarius*, Conrad; *C. diluvianus*, Green, and *C. marylandicus*, Green. The original locality of the latter is not known, and it has not recently been collected in Maryland, but occurs in Duplin County, North Carolina, and has by some accident been figured by Tuomey and Holmes, under the name of *C. diluvianus*, from South Carolina.

The cones of the old Miocene of Florida do not include any of the Antillean species described from the equivalent horizon, which is rather a surprise, but we find the three forms here described, with several well-marked varieties.

CONUS CHIPOLANUS, new species.

Shell double-conic, with a rather elevated spire of nine normal and about three lucid nuclear whorls; profile of the spire somewhat concave, turrited shoulder of the whorls sharply keeled, concave between the keel and the suture, without spiral grooving, but showing faint microscopic spiral scratches, the prominent sculpture of this area being the delicately arched lines of the anal fasciole, which are sometimes very conspicuous; the keel is wholly without nodules; sides in front of the keel straight, slightly concave toward the canal, smooth, except for incremental lines, polished anteriorly, with about nine sharp, channeled spiral grooves, besides some striations on the canal; the grooves are separated by wider interspaces and crossed by numerous elevated lines of growth, which only appear in the channels; each channel in the fully adult shell has a spiral row of faint, round tubercles close to its anterior margin; in the young the grooves sometimes cover the whole shell before the keel, and the nodules are often absent; in the adult the grooves cover somewhat less than half the whorl, while on the smooth part traces of five narrow, revolving color bands are sometimes visible, with wider interspaces; anal notch only moderately deep; outer lip thin, only moderately arched; aperture narrow, with nearly parallel sides; the pillar straight, thin, slightly twisted. Longitude of shell, 32; of spire, 7.5; maximum diameter, 15.5 mm.

Habitat.—Chipola beds (2213), Chipola River, Florida.

Types.—No. 113985, U. S. N. M.; and in the collection of Mr. Aldrich.

This species recalls *C. interstinctus*, Guppy, of the Haitian Miocene, but is a smaller, more slender, and more delicate shell, without any grooving in the sutural fasciole. It is more nearly related to *C. mary-*

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landicus of the newer Miocene, and to *C. floridanus*, Pliocene and recent, than to any of the Antillean fossils with which I have compared it.

CONUS ISOMITRATUS, new species.

Shell small, solid, short, stout, with a rather low spire of eight or nine whorls beside the nucleus; a single elevated thread runs at the shoulder, on which the suture is laid; between the sutures, which are deep and distinct, the whorl is convex, turgid, with only incremental lines; in front of the shoulder the sides are slightly swollen, the posterior half obsoletely spirally striate or smooth, anteriorly with distinct spiral threads and equal interspaces crossed by conspicuous lines of growth; the siphonal fasciole distinct, swollen, showing as a rounded ridge; outer lip straight, thin, sharp; anal notch shallow, aperture narrow, siphonal notch deep; pillar with the edge thickened and twisted, forming in well-developed specimens with the siphonal fasciole two obscure plaits; body with little or no callus. Longitude of shell, 28; of spire, 5; maximum diameter, 18 mm.

Habitat.—Chipola beds (2212, 2213), Chipola River, Florida, and Alum Bluff beds near De Funiak Springs (2238).

Types.—No. 113980, U. S. N. M.; and in the collection of Mr. Aldrich.

The young of this species have nine or ten deep grooves, with narrower interspaces, covering a little more than the anterior half of the shell. These grooves during growth become gradually modified to the adult sculpture.

CONUS ISOMITRATUS var. SULCULUS, Dall.

Shell resembling the type, except that the sutural border or shoulder of the shell is flattened or excavated with a few or numerous spiral grooves upon its surface. It is also larger. Longitude of spire, 5; of shell, 38; diameter, 24 mm.

Habitat.—Chipola beds (2212, 2213), Chipola River, Florida.

Types.—No. 113924, U. S. N. M.

The transition from a concave to a turgid sutural border, from smooth to spirally grooved, is quite gradual, though the extremes have a very different aspect, and would, by some writers, be put in different sections of the genus. This species recalls *C. mus* of the recent fauna as much as any species. It is much shorter and stouter than the line which begins with *C. sauridens* et al., and is represented in the present fauna by *C. daucus*.

CONUS DEMIURGUS, new species.

Shell large, elongate, with a large, somewhat bulbous, nucleus, and about 10 subsequent whorls; spire low, in the young nearly flat, with a distinct but not channeled suture; shoulder of the whorl angular, the space between the sutures flattish or feebly excavated, sculptured with obvious lines of growth, crossed by few, faint, obsolete, spiral, traces;

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sides of the whorl smooth, except for obsolete spiral lines, rather wide and irregularly spaced; in the anterior third they are stronger, but even there not very marked; some specimens seem to indicate a faded color-pattern of continuous, narrow, spiral lines, rather evenly and uniformly spaced; aperture narrow, of equal width, or nearly so; the anal notch moderately deep, the pillar straight, with a narrow callous part not showing any ridge or plait. Longitude of spire, 5; of shell, 65; diameter, 35; width of aperture, 6 mm.

Habitat.—Chipola beds (2211-2213), Florida.

Types.—No. 113920, U. S. N. M.; and in the Aldrich collection.

This species is the largest yet found in these beds, and among recent species finds its nearest analogue in *C. papilionaceus*, Hwass. It is a more slender shell than the latter, with more flattened spire and larger nucleus. It is a shell without striking characteristics, yet which will not fit in with any of the other forms of this horizon.

PTEROPURPURA POSTII, new species.

Shell of moderate size, with five whorls, beside the (decollate) nucleus, with three sharp, continuous varices extending down the spire and a single prominent intervarical nodule on the interspaces of the whorls; the last varix broader than any of the others, with a posterior angle, the front sculptured with fine crenulate imbricated lamellæ, the back smooth, except for the ends of the spiral ribbing; spiral sculpture of (about 15 on the last whorl) low spiral ribs most prominent on the varices and on the intervarical nodules, the rather wide interspaces finely spirally striate; aperture small, subovate, the outer lip with about seven strong teeth; the body with a thin, smooth callus; suture appressed, obscure; canal open, narrow, not quite as long as the aperture; on the siphonal fasciole a single projecting remnant of an earlier canal is visible. Length, 38; of last whorl, 28; of aperture, 14; diam eter of shell, 20 mm.

Habitat.—Ballast Point, Tampa, Florida, old Miocene silex beds: a single specimen collected by E. J. Post.

Type.—No. 130349, U. S. N. M.

It is possible this should be referred to *Pterorhytis* rather than *Pteropurpura*, but there does not appear to be any long tooth on the edge of the outer lip as usual in the former genus.

Genus GYRODES, Conrad.

Subgenus GYRODISCA, Dall.

Shell like *Gyrodes*, but small, without any channel in front of the suture, the umbilical angle crenate by the transverse lamellar or fibrous sculpture: the nucleus small, prominent, glassy, the shell otherwise

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earthy or porcelanous; the operculum like that of *Sigaretus*. Type, *Adeorbis depressus*, Jeffreys.[1]

Sigaretus problematicus and *Gibbula mitis* of Deshayes, from the Paris basin Eocene, appear from the figures to be referable here. The Cretaceous species, upon which *Gyrodes* was founded, are considerably larger, and the sutural sulcus, though not absolutely constant, gives them a different aspect. There are several Tertiary and one or two recent species which belong to the subgenus as restricted.

GYRODES (GYRODISCA) DUPLINENSIS, new species.

Shell small, with a small glassy nucleus and somewhat more than three whorls, the last much the largest; the nucleus prominent above the rather depressed spire; whorls rounded, suture very deep; base rounded; umbilicus wide, its border hardly angular; sculpture of numerous, flexuous, subequal, regular, transverse, lamellar riblets, with wider, faintly spirally striate interspaces; aperture large, very oblique, pointed above, rounded below, not interrupted by the preceding whorl; lip simple, sharp, rather flexuous, the inner one receding. Width, 3.6; height, 2.75 mm.

Upper Chesapeake Miocene of Magnolia, Duplin County, North Carolina, Burns.

Type.—No. 114430, U. S. N. M.

This species differs from most of those belonging to the subgenus by the obsolescence of the umbilical angle, though this may be, and probably is, an individual rather than a specific characteristic.

Genus UMBONIUM, Link.

UMBONIUM (SOLARIORBIS) FLORIDANUM, new species.

Shell small, depressed, three-whorled, with a smooth, glossy nucleus, the subsequent whorls depressed and tricarinate; one carina is at the periphery, one on the base, and the least prominent between the suture and the periphery; the latter fails on the last part of the last whorl, and is more or less nodulous or undulated by faintly elevated but distinct radiating ridges, which begin weak, are strongest on the keel, and die out before reaching the periphery; the base shows radiating ridges, rather stronger than those on the spire, but which do not crenulate the strong basal keel; umbilicus moderate, with a single spiral thread above the angular margin; aperture entire, oblique, the edge simple, but modified by the intersection of the keels. Diameter, 1.6; height, 1 mm.

Habitat.—Pliocene of the Caloosahatchie beds, Dall.

Type.—No. 113596, U. S. N. M.

This very small species appears adult, and has a rather solid and strong shell.

[1] Jeffreys, Proc. Zool. Soc. Lond., 1885, p. 41, pl. IV, figs. 8, 8*a*; Dall, Blake Gastr., p. 298, 1889.

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UMBONIUM (SOLARIORBIS) UNDULA, new species.

Shell small, solid, of three and a half whorls, depressed, dome-like, strongly keeled at the periphery, with a round-edged, broad carina, above and below which the whorl is more or less compressed; transverse sculpture of about a dozen rounded ripples between the suture and the periphery, the nucleus and the last half of the last whorl being free from them; these ripples cross the whorl in a flexuous manner, and differ in strength in different specimens; the base also shows radiating flexuous sculpture, but more feeble and obscure; the spiral sculpture consists of the peripheral carina, and of oblique incised lines, which are absent near the suture and umbilicus, but sharp and distinct peripherally; they cut the surface at a slight angle with the plane of the periphery; base flattish, slightly rounded in the middle, the umbilicus moderate, without any well-marked angle or internal sculpture; aperture oblique, nearly circular, produced at the upper angle; peristome simple, entire. Diameter, 2.5; height, 1 mm.

Habitat.—Miocene of the Natural Well, Duplin County, North Carolina; Burns, collector.

Type.—No. 114446, U. S. N. M.

UMBONIUM (SOLARIORBIS) DUPLINENSE, new species.

Shell small, solid, of three and a half whorls, rather depressed; sculpture on the spire of rather even, rounded, oblique, subequal, transverse riblets, with narrower interspaces, crossed by fine, sharp, close-set, spiral striæ; an incised line in front of the suture cuts off a narrow border, except on the smooth nuclear whorls; the periphery is formed by a strong, blunt-edged keel; the base is rather full, with two more rather strong keels with reticulate sculpture between them, the spirals predominating near the umbilicus and the radials near the periphery; umbilicus small, with an angular border and a single spiral thread within; aperture rounded, oblique, produced on the body whorl, entire. Diameter, 2; height, 0.75 mm.

Habitat.—Miocene of the Natural Well, Duplin County, North Carolina; Burns, collector.

Type.—No. 114445, U. S. N. M.

Though so small, the sculpture is very elegant.

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TWO NEW DIPLOPOD MYRIAPODA OF THE GENUS OXYDESMUS FROM THE CONGO.

By O. F. Cook.

NEARLY two years ago, I received from the U. S. National Museum a small collection of Myriapoda, sent in by Rev. J. H. Camp, of the American Baptist Missionary Union. The Polydesmidæ were represented by the two species of *Oxydesmus* here described.

Since the specimens have been in my hands I have had opportunity of comparing them with the types of *O. afer* (Gray) and *O. grayi* (Newport), in the British Museum, and with those of *O. tricuspidatus* (Peters) in the Berlin Museum, with none of which are they identical or closely related. As far as may be judged from the insufficient descriptions of the other species, these Congo Valley forms offer a new character in the great width of the apex of the last segment. This, however, can hardly form the basis of generic distinction, for the other characters, including those drawn from the copulatory legs of the male, offer merely specific differences from the other species of *Oxydesmus*. Indeed, the characters of the copulatory legs in the present genus are of comparatively little use in separating the species, the differences being so slight as to be very difficult of definition, even between species strikingly distinct in color, sculpture, and form.

The genera of Polydesmidæ have in very few cases been adequately described, so that their characters and affinities must be inferred mostly from what may be known of the typical species. In the case of *Oxydesmus* the species differ little in structural characters, and while the type species, *O. flavomarginatus*, is not sufficiently known, it was said by its author to differ only in color from *O. tricuspidatus*, so that a generic description is apparently practicable.

Genus OXYDESMUS (Humbert and Saussure).

Oxydesmus (HUMBERT and SAUSSURE), Verh. Zool.-Bot. Ges. Wien, 1869, p. 671.

Diagnosis.—Body large. Antennæ with four olfactory cones. Segments dorsally with three transverse rows of rounded granules or tubercles. Segments 1–4 without specially enlarged tubercles. Lateral carinæ large, the lateral edge thin and sharp, even, or nearly so.

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Repugnatorial pores 11, dorsal on the outer slope of the intramarginal ridge of segments 5, 7, 9, 10, 12, 13, 15–19. Penultimate segment exceeding segment 18. Last segment broad, or very broad, the apex more or less evidently emarginate; superior lateral tubercle usually not large.

Sterna without special structures. Male legs somewhat crassate. Male genitalia flexed, and inserted under the edge of the aperture.

Description.—Body large, about six times as long as broad; cavity nearly circular. Vertex prominent, rough; sulcus very deep. Antennæ scarcely clavate; third joint nearly as long as the second, or subequal; joints in order of length 6, 2, 3, 4=5, 1, 7.

Mandibulary stipe with exposed surface divided by sutures into six areas, two triangular, four trapezoidal. Masticatory plate lunate, oblong, the surface crossed by eight to ten transverse ridges, alternating with grooves. Dentate lamella with three to four broad, rounded teeth. Pectinate lamellæ, six.

Mentum triangular-cordate, slightly broader than long, broadly emarginate posteriorly, anterior angle sharp or rounded. Cardo small, pointed distad.

Lingual lobes with one small cone concealed on the dorsal face; median lobes with styliform processes long and simple.

First segment semi-elliptical, with the lateral corners produced and somewhat recurved, much broader than the head, longer and somewhat narrower than the second segment.

Lateral carinæ broad (one-half as wide as the body cavity), inserted near the top of the body-cylinder; sharp and thin at the entire or slightly sinuate edge, with a prominent, smooth and shining submarginal ridge. Anterior carinæ laterally curved forward, the posterior with corners produced caudad; dorsal surface finely granular, divided by furrows into three transverse rows of more or less evident quadrate areas, usually with one large, smooth granule in each.

Below the carinæ the segments are rough with conic warts; a rounded prominence just above the front pair of legs, larger in the male.

Repugnatorial pores opening dorsally on the outer slope of the submarginal ridge of segments 5, 7, 9, 10, 12, 13, 15, 16, 17, 18, 19; pores surrounded by a raised rim.

Anterior subsegments finely wrinkled longitudinally, sometimes very obscurely. Supplementary margin long, membranous, very finely striate longitudinally, not pectinate.

Anal segment finely granular, posteriorly transversely wrinkled and slightly decurved; the apex broad, rounded-truncate; on the margin three pairs of setigerous punctations, two pairs located on tubercles; the upper surface with two pairs and the under with one pair of setigerous punctations, more or less elevated.

Anal valves with two setigerous tubercles, the upper placed on the raised margin, the lower somewhat removed from it.

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Preanal scale semi-elliptic triangular, tricuspidate, the middle projection usually flat and thin; the others long conic-cylindric papillæ, with a setigerous cavity at apex.

Legs of male larger and stronger than those of female, without special modification for copulatory purposes, except that the claw of the male legs is short and stout; second joint with a short, sharp spine at apex below; joints in order of length 3, 6, 5, 2=4, 1; surface of joints not tuberculate nor papillate in either sex.

First and second pairs of legs free in both sexes; first pair much smaller than second and succeeding pairs, the two basal joints proportionately longer.

Second pair of legs of male with the coxal joint produced ventrally into a sharp cone, on the median face of which is the opening of the spermatic duct. Genitalia of female internal, protrusible. Genitalia of male apically of two parts, one of which is distally spatulate, transversely wrinkled, and with a decurved edge forming a groove which serves as a sheath for the other, styliform, ramus. Basal joint not expanded; apical joint inserted under the projecting edge of the aperture in which the genitalia lie. Segments of adult, 20.

Distribution.—The west coast of Tropical Africa.

OXYDESMUS CAMPII, new species.

Vertex prominent, granular-rugulose; sulcus very distinct.

Clypeus medianly prominent, nearly smooth or finely striate-rugulose, excavate below the antennæ; also a broad, oblique fossa midway between the antenna and the lateral margin.

First segment somewhat longer and narrower than the second, laterally decurved, especially in front; distinctly and broadly emarginate in front on each side of the prominent middle; a fine, smooth, raised margin runs entirely around; submarginal ridge smooth, very prominent, rather remote from the margin and incurved anteriorly. Surface of segment finely and evenly granular, obliquely rugulose on the anterior lateral portions; medianly in front there is a distinct prominent area; behind this a broad depression. Tubercles scarcely evident, areas wanting. Two tubercles representing the anterior row are located on the raised area; the second row is represented by two located considerably behind the middle, while of the third several are evident, the median coalesced with the posterior marginal ridge, the others very near it.

Subsequent segments gradually broader to the sixth or seventh, thence subequal to the seventeenth; second segment shortest, the others gradually longer to about the sixteenth. Anterior corner gradually less rounded, so that the middle segments have their lateral margins nearly straight, though the anterior corner is never as square as the posterior. Surface distinctly, though finely and evenly, granular, the tubercles gradually more prominent than on the first segment,

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scarcely distinguishable with the naked eye; posterior row more and more remote from the posterior margin. Areas and transverse depression behind the first row of tubercles not distinguishable except on middle segments.

Carinæ with edges faintly sinuate under magnification; submarginal ridge evident, straight, longitudinal, close to the margin, nearly smooth, shining.

Repugnatorial pores opening nearly laterad in the rather abrupt outer slope of the submarginal ridge. Above the pore the ridge is somewhat higher if viewed from the side, and the margin is somewhat decurved below the pore, causing the lateral margins of poriferous segments to appear much thicker than the others; around the pore is the usual excavation and raised rim, though not so pronounced as in some species.

Near the middle of the carinæ of poriferous segments is a slight though evident elevation, showing the probable location of the repugnatorial gland; the duct leading out to the pore may sometimes be seen.

Below the carinæ the surface is granular, the granules coarser below and toward the posterior margin; no large tubercles. Densely hirsute with long hairs along the margin.

Anterior subsegments longitudinally rugulose; sulcus between subsegments abrupt, deep, nearly smooth.

Penultimate segment with the large granules not distinct; surface uneven.

Last segment transversely rugulose, the posterior half abruptly thinner. Apex broad subquadrate, the twelve marginal and apical bristles located on or near the posterior margin.

Anal valves very finely granular, vertically somewhat rugulose; margins very prominent, thick; superior setigerous tubercle located on the margin; the inferior distinct, large.

Preanal scale prominent in the anterior portion; setigerous tubercles long, mamillate, subequal to the broader median process.

Sterna granular, without hairs between the bases of the legs, but hirsute in front and behind.

Male legs hirsute, the hairs rising from small tubercles, especially on the distal joints; femora distinctly spined.

Color in alcohol dull brown to nearly black, the submarginal ridge, legs, and antennæ, reddish; also a triangular median spot on the anterior subsegments. The apex of the triangle is directed caudad; sometimes it is produced a short distance upon the posterior subsegment.

Length, about 60 mm.; width, 11.5 mm.

Locality.—Near Leopoldville, Congo Free State, four males, collected by Rev. J. H. Camp, for whom the species is named, in the National Museum collection.

No. 758 of the Berlin Museum, collected at Chinchoxo, by Dr. Falkenstein, is a male of this species.

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OXYDESMUS FLABELLATUS, new species.

Head as described for *O. campii*, and somewhat more hirsute.

First segment not so decurved as in *O. campii;* anterior emarginations not evident; raised margin not distinct posteriorly; surface of segment finely granular, uneven, but the granulation not nearly so pronounced as in *O. campii*, so that the surface appears smooth except in the depressions; tubercles very minute, the anterior median pair very close to the anterior margin; posterior row indistinguishable, suggested only by slight unevenness of the posterior margin.

Subsequent segments very similar to those of *O. campii*, but not so long; the carinæ are evidently shorter, the posterior margin of the anterior and middle ones being directed slightly cephalad from the horizontal, instead of slightly caudad, as is the case with the middle segments of *O. campii.* The difference in the length of the segments is, however, still more evident on the posterior segments, the posterior corners of which are more extended caudad in *O. flabellatus.* Surface somewhat smoother than in *O. campii*, and the tubercles less distinct; the arched median portion more convex and somewhat shining; tubercles visible to the naked eye on median segments, the areas obsolete, and the transverse sulcus very nearly so.

Below the carinæ the surface is less granular than in *O. campii*, but above the bases of the legs are two clusters of coarse papilliform tubercles; that opposite the anterior leg has the tubercles more crowded and shorter, and is placed on a rounded, cushion-like elevation.

Anterior subsegments somewhat more finely rugulose-striate longitudinally.

Last segment somewhat flabellate, the lateral margins evidently divergent caudad; posterior marginal tubercle much larger than the anterior, instead of subequal.

Anal valves distinctly granular and vertically rugulose, the margins also granular. Preanal scale with the median prominence of the same shape as the setigerous tubercles, but much larger and longer.

Sterna hirsute between the bases of the legs, the hairs rather scattering, rising from small tubercles.

Color in alcohol nearly black, with a slight brownish-vinous tinge, concolorous; legs scarcely paler.

Length, 65 mm.; width, 11.5 mm.

Locality.—One male specimen from the vicinity of Stanley Pool, Congo Free State, collected by Rev. J. H. Camp, in the National Museum collection.

As may be judged from the description, this species is evidently related to *O. campii*, from which it seems distinct in the characters noted.

The description was drawn with specimens of both species in hand, and that of *O. campii* may be supposed to apply to *O. flabellatus*, except where modified in the description of the latter.

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The shorter carinæ are also more distant from each other, and this, with the slight actual difference in length, makes the present species appear more slender. The differences in color, especially of the legs and antennæ, are striking, while the shape of the last segment and preanal scale are unique and diagnostic. The differences are thus along lines which in other species do not appear subject to much variation, though their constancy in the present case must be shown by further collection.

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PRIODESMUS, A NEW GENUS OF DIPLOPODA FROM SURINAM.

By O. F. Cook.

THE specimen on which this description is based came into my possession about two years ago, and seems to represent a new *generic* type. That the *species* is also new, I have not the same degree of confidence, for there are a large number of very poorly described South American Polydesmoidea in the literature of the Diplopoda. However, none of the descriptions seem to accord with the present form, nor even to approximate it. I noticed nothing closely comparable among the older types in the British Museum, nor is there anything of the kind among the Petersian types of the Berlin Museum. There is, however, in the Berlin Museum an undetermined female specimen from Para which is certainly generically the same, and may possibly prove to be specifically identical, for a satisfactory knowledge of the secondary sexual characters of the genus is impossible until more specimens have been obtained.

PRIODESMUS, new genus.

Rhachidomorpha, PETERS, *pro parte*, not of SAUSSURE.

Body rather small.

Antennæ with four olfactory cones.

Segments dorsally thickly beset with small and large granules.

Lateral carinæ of moderate width, the margins deeply incised-dentate.

Repugnatorial pores 11, dorso-lateral, on capitate processes of segments 5, 7, 9, 10, 12, 13, 15–19.

Penultimate segment not specially shortened.

Last segment triangular, the apex rounded.

Sterna of legs 3–6 of males, each with two conic processes; other sterna unmodified.

Male legs slightly crassate, the third joint of legs 4–7 inflated on the ventral side.

The following more detailed description is given:

Body rather small, about nine times as long as broad, sides parallel to near the ends; cavity circular.

Vertex granular, sulcus evident; post-antennal depression moderate; sense organ large; margin not excised.

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Labrum slightly emarginate, with three distinct teeth.

Antennæ subclavate, joints in order of length 2, 3, 4, 5 = 6, 1, 7, beset with piliferous granules.

Mandibulary stipe with exposed surface granular, divided into the usual five areas.

Hypostoma strongly arcuate, deeply and broadly emarginate in front. Cardo present, *in situ* perpendicular to the stipes. Mentum subtriangular, broader than long, pointed in front, very broadly emarginate behind, densely granular-pilose. Stipes three times as long as broad, granular-pilose, a deep sulcus near the lateral margin. Lingual laminæ three times as long as broad, granular-hirsute. Lingual and median lobes distinct.

First segment less than three times as broad as long (13:7); anterior and posterior margins convex; posterior corners acute; lateral margins dentate. The segment is subequal in width to the head, and distinctly narrower and longer than the second segment.

Segments with dorsal surface slightly convex, densely beset with granules of two sizes, the smaller very numerous and without order, the larger more or less evidently arranged in three transverse rows. Fourth and subsequent segments with a distinct transverse furrow.

Lateral carinæ moderately broad, about one-fourth as wide as the body cavity, inserted nearly on a level with the dorsum; margin thickened and deeply excised into coarse teeth, longer on posterior segments and directed caudad.

Repugnatorial pores of medium size, directed laterad, located on a large capitate horizontal process rising from near the middle of the carinæ of segments 5, 7, 9, 10, 12, 13, 15–19. Below the carinæ the segments are densely granular. Inferior carina interrupted, represented by an anterior and a posterior dentate process, both large and distinct. Anterior subsegments distinctly, though very minutely, granular.

Supplementary margin rather long, irregularly striate longitudinally, the free edge entire.

Last segment as long as the preceding, with twelve setiferous tubercles and four apical setæ. Eight of the setiferous tubercles are located in the apical portion of the segment; the other two pairs on the sides below the level of the carinæ.

Anal valves with moderately elevated, compressed margins and two setigerous tubercles, the upper located on the margin, the lower considerably removed from it.

Preanal scale triangular, pointed; two setigerous tubercles toward the apex.

Sterna sparsely and minutely granular, a very small conical spine at the base of each leg (in the male only?); spiracles large, the margins tumid. Sterna of legs 3–6 of male, with a large conical spine at the base of each leg.

Legs of male slightly crassate; the ventral face of the third joint of legs 4–7 inflated.

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Second legs of male with coxæ stout, produced ventrad into a rounded-conic process, in the median face of which is the opening of the seminal duct.

Male genitalia with the basal joint large and bulbous; second joint very short, with two processes of subequal length, the larger toothed at apex, the smaller simple, needle-like.

Priodesmus is a type strikingly different from any of the related genera, and although the differences are mostly quantitative, the new form shows, as far as is yet known, the extreme of development and specialization in the line it represents. Indeed, the aspect of the animal is so bizarre and peculiarly different from evidently related genera as to warrant the suspicion that it will be found explainable by some unusual local condition.

The affinities of this genus are with species described under *Rhachidomorpha*, such as *R. nodosa*, Peters, which appears to be nearer to the present form than to *R. tarasca*, Saussure, the type of that genus, and may, at least provisionally, stand as a species of *Priodesmus*.

PRIODESMUS ACUS,[1] new species.

(Plate I, figs. 1–19.)

Body oblong, the sides parallel, the segments of nearly equal width to near the extremities; dorsum slightly convex, the carinæ horizontal.

Vertex prominent, especially above; densely granular, without hairs; sulcus deep, extending below the antennæ, but there very indistinct. Between the antennæ it meets an indistinct sulcus from each antennal socket, the two converging caudad at the point where the vertical sulcus ceases to be distinct.

Clypeus smooth and shining, with a few distinct granules; no hairs, though these may have been rubbed off. The surface is granular immediately below the antennæ, but smooth farther down and in the middle.

Antennæ moderately pilose, the hairs rising from conic granules; length, 5 mm.; joints 2–6 subequal, second joint longest, the sixth much the thickest.

Mandibulary stipes rather large, the sutures appearing as fine, smooth lines in the granular surface.

First segment somewhat lenticular in outline; a fine anterior raised margin; traces of four transverse rows of large granules. Lateral edge somewhat irregularly quadridentate, the posterior tooth somewhat produced obliquely backward. Somewhat removed from the lateral margin is an oblique sulcus.

Subsequent segments shorter than the first; large granules in three distinct rows, the third of which is close to the posterior margin; the four marginal teeth more or less distinct, the posterior increasing in

[1] The generic name alludes to the coarsely serrate segments; the specific to the slender process of the male genitalia.

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length. The whole surface of the segments is thickly granular, except the apices of the marginal teeth and the large granules, which are smooth and shining; anterior margin of carinæ raised on anterior segments.

Fourth and subsequent segments to the eighteenth with a transverse furrow, very indistinct on the fourth and eighteenth; on some of the segments the transverse furrow divides, the branches turning to the anterior and posterior margins.

Repugnatorial pores located near the middle of an oval smooth area which faces obliquely upward, laterad and cephalad; pore immediately surrounded by a very minute rim.

Lateral carinæ coarsely dentate as above, and with a fine raised anterior margin.

On posterior segments, the whole carina is more curved caudad and produced. Last segment with finer granules than the preceding.

Anal valves finely granular-rugulose. Preanal scale with surface evenly convex and with scattering granules.

Legs moderately pilose, the surface scarcely granular. The prominence of the ventral face of the male legs is somewhat more densely pilose. The process of the coxa of the second male legs is smooth and shining, but with a long bristle at apex.

Male genitalia with apex of larger branch deeply bidentate; the smaller tooth simple, pointed; the larger flattened at right angles to the smaller, and with several small teeth.

Color dull reddish-brown, rather dark; legs and antennæ lighter, tending to yellowish; ventral surface and basal joints of legs sordid brownish.

Length, about 27 mm. (the specimen was broken); width, 3 mm.

Locality.—One male specimen in the National Museum collection, obtained in Surinam, May, 1893 (Beyer).

PRIODESMUS PARÆ, new species.

The species differs from *P. acus*, as here described and figured (Pl. I, figs. 1–19), in the following details:

Dorsum distinctly, though not strongly, convex.

Vertex densely granular-rugulose.

Antennæ somewhat more slender.

First segment distinctly narrower and slightly longer than in *P. acus;* the posterior corners not prominent and spiniform as in that species.

Dorsal surface about as densely granular as in the figure of *P. acus;* the large granules of the anterior and posterior rows more distinct, those of the other rows less so. Anterior raised margin not evident.

Subsequent segments somewhat more densely granular, as above; the anterior and posterior rows of large granules larger, the middle inconspicuous.

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Lateral carinæ not as broad as in *P. acus*, a usual sexual difference, but the posterior corner is in all cases less produced than in that species, and the large tooth of the posterior corner is rounded and not prominent, while the next mesad on the posterior margin is conspicuously enlarged, on the anterior segments more especially.

Repugnatorial pores located as in *P. acus*, but the poriferous process shorter and less distinctly capitate.

Last segment distinctly shorter than in *P. acus;* the superior lateral tubercle smaller.

Preanal scale regularly semicircular, medianly abruptly mucronate; the setigerous tubercles distinctly less prominent than in *P. acus*.

Legs much shorter, a usual sexual difference.

Genitalia oblong, large, and very prominent, with the ventro-caudal aspect showing three distinct teeth on each side.

Color in alcohol bright brown, darkest on anterior segments and in the sutures and transverse sulci of the dorsal surface of the segments; ventral surface, legs, antennæ, and margins of carinæ nearly white. The color is almost exactly the same as in *P. acus*, but the shades are much lighter.

Length, 28 mm.; width, 3.3 mm.

Locality.—Para (Schulz). A single female specimen in the Berlin Museum. As stated above, this may prove to be the female of *P. acus*, but the differences are such that the analogy of other Polydesmoidea makes this improbable.

EXPLANATION OF PLATE I.

Priodesmus acus, male.

FIG. 1. First five segments, dorsal view.
2. Segments 7 and 8, dorsal view; the small granules are somewhat too numerous on this figure.
3. Gnathochilarium.
4. Antenna.
5. Apex of antenna, showing the arrangement of the olfactory cones, subdiagrammatic.
6. Tenth segment detached.
7. Leg of pair 31.
8. Leg of pair 3.
9. Leg of pair 9.
10. Genitalia, ventral view.
11. Genitalium, lateral view.
12. Apex of larger ramus of genitalium.
13. Segments 16–20, dorsal view.
14. Apex of last segment, apico-ventral view.
15. Segments 18–20, ventral view.
16. Same, lateral view.
17. Last segment, dorsal view, more magnified.
18. Leg of pair 6.
19. Apex of same.

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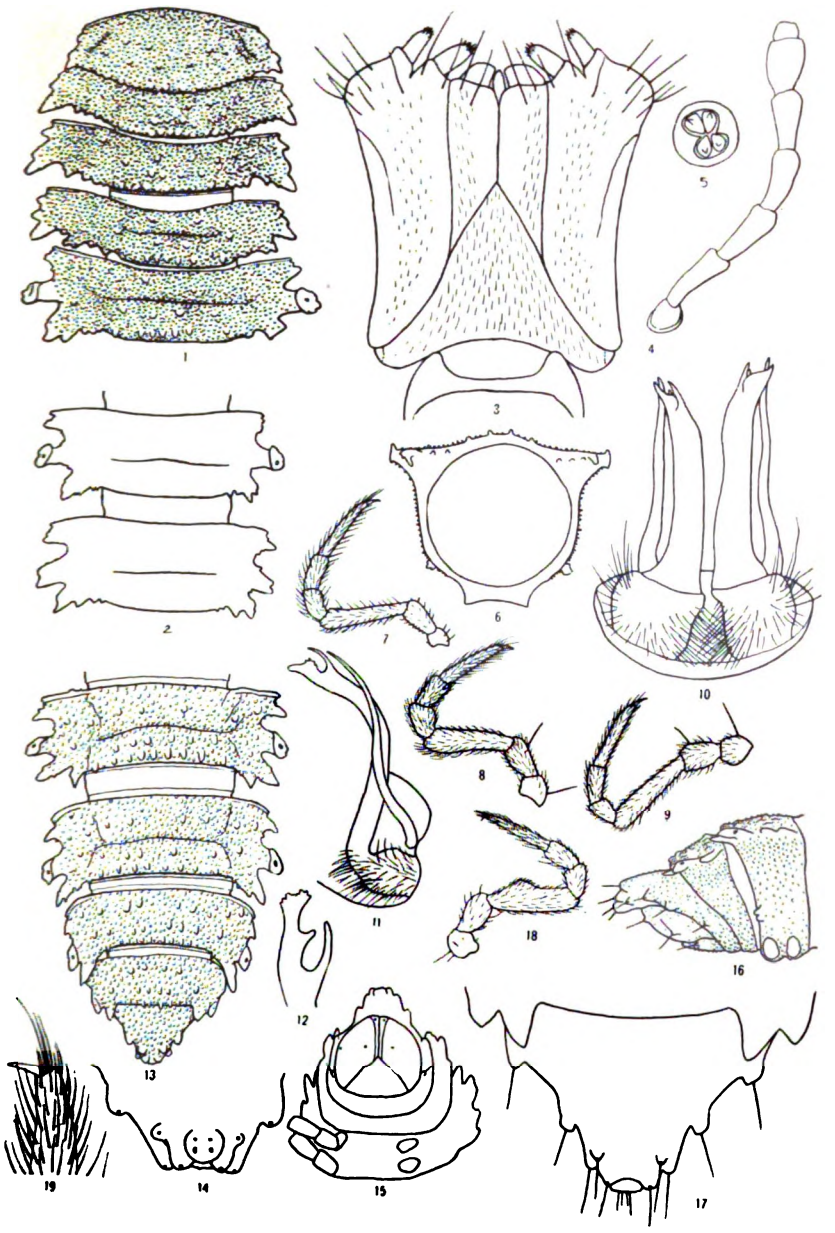

PRIODESMUS ACUS, MALE

FOR EXPLANATION OF PLATE SEE PAGE 57

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ON GEOPHILUS ATTENUATUS, SAY, OF THE CLASS CHILOPODA.

By O. F. Cook.

THE identification of this species has not proved an easy task. Dr. Wood says of his *Mecistocephalus fulvus:* "It may possibly be *Geophilus attenuatus*, but that species can never be determined from Say's description." The late Charles H. Bollman has, however, attempted an identification,[1] which places as synonyms of *G. attenuatus* the following species: *G. bipuncticeps*, Wood, *G. georgianus*, Meinert, and *G. perforatus* (McNeill). It is not necessary here to touch upon the question of the identity of *G. georgianus* and *G. perforatus* with *G. bipuncticeps*, further than to agree that they are at least related species. The ground on which Mr. Bollman based the identification of *G. bipuncticeps* with *attenuatus*, was that *bipuncticeps* was the only species of the southeastern region which could bear Say's description. Lest this view should be taken as final, it seems best to publish the fact that there exists in the region indicated another animal to which Say's description is much more applicable.

In interpreting Say's language it should be taken into consideration that he gives closer attention to the colors than to the other characters, and that his color descriptions of Myriapoda are absolute, his acquaintance with the group not being sufficient to enable the use of many comparative differences. The colors of Geophilidæ vary indeed, but within limits and in a definite direction. Young and recently molted individuals are pale and become darker with age. The strictly subterranean species usually remain very light, while those living under stones or bark of decaying trees have a more pronounced coloration. Thus, between white or pale specimens the exact shade may be of little importance in specific diagnosis, but a deep color, such as a reddish-brown, is quite a different matter. Say calls *Geophilus rubens*,[2] a much deeper-colored species, "red," but not brown, while *Scolopocryptops*

[1] Bull. 46, U. S. Nat. Mus., p. 148, 1893.

[2] Mr. Bollman was correct in identifying *Geophilus cephalicus*, Wood, with this species. I have examined the type in the British Museum.

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is "reddish-ferruginous," and the head of *Cryptops* is "reddish-brown," and the body "white." Thus, if we take Say's statement at face value, its application is not so difficult. Only one reddish-brown *Geophilus* is known from Europe and North Africa, *Geophilus ferrugineus*, C. L. Koch. In view of the fact that no Geophilidæ common to the two continents had then been reported, it was something of a surprise to me, three or four years since, to find a specimen of *Geophilus ferrugineus* in a bottle of Myriapoda collected in the vicinity of Philadelphia. This was dissected and carefully compared with the descriptions of the various European authors, and with Swedish specimens of *G. ferrugineus*, also dissected. In 1893 I collected several specimens near St. Michaels, on the eastern peninsula of Maryland, some of them under stones and rotting wood, some under bark of decaying locust (*Robinia*). The reddish-brown color of the living animals is noticeably different from that of any other Geophilidæ I have collected in North America.

This species corresponds even in habitat with *Mecistocephalus fulvus*, Wood. The only discrepancy of importance seems to be that of the number of legs. Wood gives 57, while none of my American specimens have more than 49, most of them 47.[1] In the Canary Islands, however, I collected numerous examples of this species with 57, and some with 59 legs. That Wood should describe this species under *Mecistocephalus* need not be a matter of surprise if we consider that he was dealing with the type of that genus. Thus the genus *Pachymerium*, C. L. Koch, being founded on the same species, is identical with *Mecistocephalus*, Newport. It is an error to cite Newport as the author of the genus as employed by recent writers. As constituted by Newport it was based entirely upon the length of the cephalic lamina, and was no more natural a group than the genera of C. L. Koch; to have been consistent, Meinert should have set it aside, as he did Koch's genera. However, *G. attenuatus* is a species differing from *Geophilus* as represented by *carpophagus* sufficiently to merit generic recognition. The synonymy of the genus and the species will then stand as follows:

Genus MECISTOCEPHALUS, Newport.

Mecistocephalus, NEWPORT, Proc. Zool. Soc., London, CXIX, p. 177,[2] 1842.
Pachymerium, C. L. KOCH, System der Myriapoden, pp. 85, 187, 1847.
Geophilus (pp.) MEINERT, LATZEL, etc.

Cephalic lamina long and narrow; frontal lamina distinct; basal lamina narrow; prosternal teeth evident; claw of prehensorial feet, with a strong tooth at base; coxa toothed. Ventral pores inconspicuous; last sternum narrow; pleural pores numerous, pigmented; anal legs slightly crassate in the male, clawed. Anal pores present.

[1] It is evident from the fact that Wood frequently ascribes an even number of legs to his Geophilidæ that they were not too carefully counted. It is also easy to make a mistake of ten in counting.

[2] Latzel's citation of Trans. Linn. Soc. London, XIX, 1844, for this genus (Öst.-Ung. Myr. I, p. 15), is an error which that author has himself corrected on p. 160.

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Type.—*Mecistocephalus attenuatus* (Say), 1819, the synonymy of which is as follows:

Geophilus ferrugineus, C. L. KOCH, Deutschl. Crust. Myr. u. Arach., 1835.
Pachymerium ferrugineum (C. L. KOCH), System der Myriap., p. 187, 1847.
Mecistocephalus fulvus (WOOD), Journ. Acad. Nat. Sci. Phila., V. p. 41, 1863.

Distribution.—Europe, North Africa, Canary Islands, Eastern North America.

This disposition leaves the species hitherto called *Mecistocephalus* in need of a generic name, and *Dicellophilus* is proposed for the species congeneric with *Mecistocephalus limatus*, Wood, in allusion to the forked chitinous thickening of the ventral plates. The species which this change affects are: *limata* (Wood), *breviceps* (Meinert), *melanonotus* (Wood), *quadrata* (Wood). This genus is further defined by the frontal lamina being completely chitinized above the labrum, the margin of the labrum laciniate, and the cephalic lamina without a claw-like chitinous callosity at the sinus of the frontal lamina.

The generic name *Lamnonyx* may be applied to the species which have the cephalic lamina incompletely chitinized, the margin of the labrum entire, and a claw at the anterior corners of the cephalic lamina below. *Lamnonyx leonensis*[1] may be taken as the type. The claw-like structure of the cephalic lamina seems not to have been observed previously, but as I find it on all the specimens at hand from the Eastern Continent, the species to be referred to *Lamnonyx*, provisionally at least, are the following: *carniolensis* (C. L. Koch), *castaneiceps* (Haase), *gigas* (Haase), *japonicus* (Meinert), *leonensis*, *maxillaris* (Gervais), *punctifrons* (Newport), *punctilabrum* (Newport), *spissus* (Wood), *tenuiculus* (L. Koch), synonyms having been omitted. These species are mostly in need of study which shall make known the character of the mouth parts.

Mecistocephalus microporus, Haase, is apparently generically distinct from the others by reason of the very numerous segments, the enormous pleuræ, and peculiar conformation of the posterior scuta; it may stand as the type of a new genus, to be called *Megethmus*. The genus *Dicellophilus* may be taken as the type of a distinct family, separable from the Geophilidæ and Notiphilidæ by many characters, among which are the following: Body attenuate caudad; head large, long, and narrow; frontal lamina always distinct, more or less chitinized above the labrum. Cephalic lamina not concealing the prehensors; a claw-like callosity at the sinus of the frontal lamina. Labrum entirely free, tripartite, the median part very small, the lateral parts large, transversely carinate. Laminæ fulcientes linear, extending back past the maxillary sternum as chitinous margins of the cephalic lamina. Mandibles with numerous pectinate lamellæ; no dentate lamellæ. Labial sternum always divided, simple; labial palpus and interior labial process subsimilar in shape, distinct, consisting of a basal portion

[1] A new species from Sierra Leone and Liberia, in the National Museum collection.

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(joint?), supplemented by a spatulate hyaline portion. Maxillary sternum entire and distinct; maxillary palpus slender; claw simple; basal joint subequal in length to the other two taken together. Prehensorial sternum without chitinous lines. Pleuræ of the prehensorial sternum divided by chitinous ridges into three areas. Sterna with a median anteriorly bifurcate chitinous thickening. Ventral pores wanting. Last sternum very short; last pleuræ very large and long, with numerous pigmented pores. Anal pores present; anal legs without claws. Number of segments constant on both sexes of each species.

In most of these characters, the Dicellophilidæ approach the Scolopendridæ rather than the other Geophiloidæ. Especially is this the case with the mouth parts, the lack of ventral pores, the last segment, and the constant number of segments.

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AN ARRANGEMENT OF THE GEOPHILIDÆ, A FAMILY OF CHILOPODA.

By O. F. Cook.

THAT THE genera included in this family present structural characters of great diversity has been known since the publication of Meinert's investigations. That author attempted no subdivision of the family into groups higher than genera, a course to be explained by the fact that the number of genera recognized by him was very small, and by the further consideration that some of the more important structures were misunderstood. Thus the labrum of *Orya* is given as "*bipartitum*," while in reality it is entire, the bipartite appearance resulting from the fact that the part in question is arched when in place, and usually becomes wrinkled in the middle when depressed by a cover glass. The labrum of *Orphnæus* is said by Meinert to be free; in reality it is completely coalesced and closely homologous to that of *Orya*. The labrum of the primitive Chilopoda was, in all probability, tripartite, and the coalescence of the parts with each other and with the frontal lamina are to be viewed as deviations from the ancestral form. Relationships can not, however, be inferred merely from such a fact as coalescence; *Orya* and *Schendyla* have the labrum entire and completely coalesced, and yet represent two very distinct lines of development.

The present method of describing the mandibles has been another source of confusion. As in other Chilopoda the mandibles of Geophilidæ may be supposed to have had originally both pectinate and dentate lamellæ. The compound pectinate lamellæ of *Dicellophilus*,[1] *Orya* and *Himantarium* are evidently the homologues of the laciniate processes of the mandibles of Scolopendridæ and Lithobiidæ, while the mandibles of such genera as *Geophilus* and *Schendyla* have developed differently, the laciniate processes being now represented by a row of simple spines. Thus one of the simple spines of *Geophilus* is to be looked upon as homologue of a whole "pectinate lamella" in *Himantarium*, and the mandibles of the two genera are structurally much wider apart than

[1] A new genus partially equivalent to *Mecistocephalus* of Meinert and recent authors, but not of Newport. According to Meinert, the mandibles of *Mecistocephalus* have only dentate lamellæ, but the reason for this view is not apparent.

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could be inferred while the opinion held that the so-called "pectinate lamellæ" in the two cases were structural equivalents.

That the dentate lamellæ have been suppressed in *Dicella* and *Orya* is a case of apparent similarity between genera distinct by nearly all possible characters, and an example of the principle that the presence or suppression of a primitive structure or character is not of itself an evidence either of close affinity or wide divergence.

Since the publication of Meinert's works the number of described genera has greatly increased; likewise the desirability of some arrangement whereby their affinities may be made apparent. Unfortunately, the descriptions of new forms are often very incomplete and omit the most important data, those to be drawn from the mouth parts. Notwithstanding this neglect, it is evident from many specific descriptions that the number of genera yet to be recognized is considerable, and it would seem that a statement of the affinities already manifested will aid in subsequent study.

That a complete arrangement, such as is here proposed, can in the present state of the subject be entirely correct or satisfactory is not to be expected. Cases of uncertain and deficient data are noted in several places. The groups here proposed as families seem to have, by analogy with other classes and with other Chilopoda, ample structural basis for such recognition. The external form and habit are almost identical for the entire group, and the structural differences are not to be explained as correlated with adaptations to localities or hosts, but are rather the accumulated result of variation without the interference of any important principle of selection, a history the more possible because the changes are mostly in the direction of degeneration. From this consideration we may explain the confusing fact that in the different groups there are frequent examples of the preservation of some primitive character which the other members of the family may have lost, and on the other hand there are numerous cases of parallel variation. Of this last the pleural pores are a good example. These may be numerous and distinct, doubtless the primitive condition, and the one which appears in Scolopendridæ; they may be clustered about two or more large cavities in the pleuræ, or they may be entirely wanting. In the genus *Geophilus* the first and second conditions are present, and, if some descriptions are to be trusted, also the third. To suppose that a character which may differ in closely related species can be of use as an evidence of affinity between genera or families would be clearly unreasonable. And yet poriferous foveolæ entirely similar to those of some species of *Geophilus* occur in *Schendyla* and several related genera, in *Ballophilus*, and *Dignathodon*. Thus animals with widely divergent types of labrum, mandibles, and other parts, live in the same localities, have the same habits, and eat the same food with apparently equal success, so that it seems impossible to imagine that special advantages pertain to the different adaptations.

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The opinion has recently been advanced that the Geophilidæ and Scolopendridæ should rank as orders,[1] the distinction being based on the number of segments and spiracles. That a merely quantitative difference is sufficient for ordinal distinction may well be doubted. At the same time the recognition of groups of Epimorpha higher than families is desirable and possible, but they can hardly be more than superfamilies. Indeed, it is not easy to suggest a *diagnostic* structural difference between the Scolopendroidæ and Geophiloidæ. The two superfamilies may, however, be defined as follows:

Superfamily SCOLOPENDROIDÆ.

Antennæ with 17–33 joints; eyes present or wanting; basal lamina obsolete; prosternal teeth present or wanting; spiracles 9–19; ventral pores wanting; last pleuræ porose, more or less produced caudad; segments 21–23, constant for genera and species.

Superfamily GEOPHILOIDÆ.

Antennæ with 14 joints; eyes wanting; basal lamina present; prosternal teeth rudimentary or wanting; spiracles present on all pediferous segments except the first and last; ventral pores usually present; last pleuræ not produced, sometimes eporose; segments 31–173, not constant for genera, rarely so for species.

That future study will necessitate the recognition of family types among the Scolopendroidæ is not improbable; the families of Geophiloidæ may be distinguished by the following artificial key:

ANALYTICAL KEY TO THE FAMILIES OF GEOPHILOIDÆ.

A. Ventral pores wanting; suprascutella in five rows; last pleuræ occupying three segments ..... GONIBREGMATIDÆ.
Ventral pores distinct in all cases where suprascutella are present; last pleuræ affecting last segment only ..... B.

B. Basal segment very broad, concealing the pleuræ of the prehensors ..... C.
Basal segment not or scarcely broader than the cephalic lamina, the prehensorial pleuræ evident from above ..... D.

C. Ventral pores in one median central or posterior area ..... E.
Ventral pores in two or more areas, anterior and posterior ..... F.

D. Labrum entire; mandibles with one pectinate and 1-3 dentate lamellæ; ventral pores, if present, in a central area ..... SCHENDYLIDÆ.
Labrum tripartite, mandibles without dentate lamellæ; ventral pores, if present seldom in a central area ..... G.

E. Mandibles with one pectinate lamella; labrum tripartite, the lateral parts greatly reduced or rudimentary ..... DIGNATHODONTIDÆ.
Mandibles with dentate and pectinate lamellæ; labrum entire ..... H.

F. Last pleuræ coxæform, without pores; anal legs unarmed; antennæ attenuate ..... ORYIDÆ.

[1] Silvestri, Orders Oligostigmata and Plantastigmata, Ann. d. Museo Civico di Storia Nat. di Genova, XIV, pp. 623, 634, 1895.

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Last pleuræ inflated, porose; anal legs with a distinct claw; antennæ filiform or crassate, not attenuate ..... DISARGIDÆ.

G. Mandibles with one pectinate lamella; labial sternum entire; ventral pores normally present ..... GEOPHILIDÆ.

Mandibles with several pectinate lamellas; labial sternum divided; ventral pores wanting ..... DICELLOPHILIDÆ.

H. Antennæ geniculate, more or less clavate; segments scabrous, dorsally with a transverse depression; ventral pores perforating an elevated chitinous plate lying along the posterior margin of the segments ... BALLOPHILIDÆ.

Antennæ attenuate, not geniculate; segments smooth, or nearly so, without transverse furrow; ventral pores in a small central or subcentral depression ..... HIMANTARIIDÆ.

GONIBREGMATIDÆ, new family.

Antennæ filiform; frontal lamina coalesced; cephalic lamina not concealing the prehensors; prebasal lamina obsolete; basal lamina broad; mouth parts unknown; prehensorial sternum very broad; suprascutella present in five rows; ventral pores wanting; last sternum very small; last pleuræ enormously developed, extending along three segments; pores very numerous; anal pores wanting; anal legs carinate, five-jointed, without claw. Pairs of legs, 161.

Genus GONIBREGMATUS, Newport.

Gonibregmatus, NEWPORT, Proc. Zool. Soc. London, CXIX, p. 180, 1842.

Distribution.—Philippine Islands.

Type.—*Gonibregmatus cumingii*, Newport.

The known characters of this genus are so remarkable that others equally interesting are to be expected from an examination of the mouth parts..

ORYIDÆ, new family.

Antennæ attenuate or subfiliform; frontal lamina coalesced or distinct; cephalic lamina concealing the prehensors; prebasal lamina obsolete; basal lamina broad; labrum entirely coalesced; mandibles with several pectinate lamellæ; no dentate lamellæ; labial sternum entire, simple, or provided with processes; labial palpi one-jointed, with or without processes; interior labial palpus distinct; maxillary palpus with claw simple or pectinate; prehensorial sternum very broad; suprascutella present in one or more rows; ventral pores in 1–4 transverse indefinite areas; last sternum broad; the pleuræ not inflated, without pores; anal pores wanting; genital palpi two-jointed; anal legs six-jointed, without claw. Pairs of legs, 67–125.

Genus ORYA, Meinert.

Orya, MEINERT, Nat. Tidsskr. VII, p. 14. 1870.

Type.—*Orya barbarica* (Gervais) Meinert.[1]

Distribution.—North Africa; Spain.

[1] Mag. Zool de Guérin, IX.

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Genus ASPIDOPLERES, Porat.

Aspidoleres, PORAT, Bih. t. k. Svenska Vet. Akad. Hand., Afd. IV, No. 7, p. 15, 1893.

Type.—*Aspidopleres intercalatus*, Porat.

Distribution.—Damaraland.

Genus ORPHNÆUS, Meinert.

Orphnæus, MEINERT, Nat. Tidsskr., VII, p. 17, 1870.

Type.—*Orphnæus phosphoreus* (Linnæus).[1]

Distribution.—Tropics of both hemispheres.

Genus NOTIPHILIDES, Latzel.

Notiphilides, LATZEL, Zoologischer Anzeiger, III, No. 68, p. 546, 1880.

Type.—*Notiphilides maximiliani* (Humbert and Saussure).[2]

Distribution.—Mexico.

It may be that *Mesocanthus*, Meinert, should be placed in this family, but though the mandibles are said to have only pectinate lamellæ, it would appear from Meinert's diagram that they are of a character entirely different from those of *Orya* and *Orphnæus*.

Family HIMANTARIIDÆ, new name.

Notiphilidæ, C. L. KOCH, System der Myriapoden, 1847.

Antennæ attenuate; frontal lamina coalesced or distinct; cephalic lamina concealing the prehensors; prebasal lamina obsolete; basal very broad; labrum entire, free; mandibles with one dentate and several pectinate lamellæ; labial sternum entire, simple; labial palpus one-jointed; interior labial process distinct; maxillary sternum entire; claw of maxillary palpus excavate (spoon-shaped), more or less pectinate; prehensorial sternum very broad, with chitinous lines; supra-scutella present, in one or more rows, or wanting; ventral pores in one central area; anal pleuræ more or less inflated, with few or many pores; anal pores wanting; genital palpi two-jointed; anal legs six-jointed, without claw. Pairs of legs, 67–173.

Genus HIMANTARIUM, C. L. Koch.

Himantarium, C. L. KOCH, System der Myriapoden, p. 82, 1847.

Type.—*Himantarium gabrielis* (Linnæus).[3]

Distribution.—South Europe; North Africa.

Genus BOTHRIOGASTER, Seliwanoff.

Notiphilus, C. L. KOCH, System der Myriapoden, p. 82, 1847.

Bothriogaster, SELIWANOFF, Zool. Anzeiger, XLIII, p. 620, 1879.

Type.—*Bothriogaster signatus* (Kessler).[4]

Distribution.—Greece to Turkestan.

[1] Syst. Nat., Ed. X, p. 368, 1770.
[2] Revue et Mag. d. Zool., 1870, p. 205.
[3] Syst. Nat., Ed. XII, p. 1063, 1766.
[4] Trudy, Russ. Entom. Obsz., VIII, p. 39. figs. 4, 5.

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Notiphilus has not been identified by recent writers, and was considered by Meinert to be a synonym of *Himantarium*.[1] Koch's description is, however, quite extensive and explicit, and offers several characters sufficient to distinguish the genus from *Orya* and *Himantarium*. From *Bothriogaster* it is difficult, if not impossible, to indicate distinctions; indeed there is no evident reason why Seliwanoff's description and figures of *Bothriogaster signatus*, Kessler, do not correspond with Koch's *Notiphilus tæniatus*,[2] as Seliwanoff has himself suggested by placing *Notiphilus tæniatus* as a doubtful synonym of *signatus*. Later on *signatus* was reported from Greece by Dr. Karsch,[3] so that not even a difference in habitat remains. Nevertheless it can hardly be asserted with confidence that the animals are specifically and generically the same, but the agreement in all important characters is so great that a generic difference is exceedingly improbable. The fact that Koch gives the legs as varying from 100 to 154 suggests the possibility that he may have had more than one species under observation. The matter will probably remain more or less in doubt until the Greek Myriapoda are better known, but for our present purpose it is sufficient to point out that *Notiphilus* would be a valid genus, were not the name preoccupied in the Diptera, and that *Bothriogaster* may replace it until the typical species are shown to be distinct, and not congeneric.

Genus STIGMATOGASTER, Latzel.

Stigmatogaster, LATZEL, Myr. Oest.-Ung. Mon., I, p. 211, 1880.

Type.—Stigmatogaster gracilis (Meinert).[4]

Distribution.—South Europe; North Africa.

Genus STYLOLÆMUS, Karsch.

Stylolæmus, KARSCH, Troschel's Archiv f. Naturges., Jahrg. XLVII, Heft. 1, p. 9, figs. 3, 3*a*, 3*b*, 1881.

Type.—Stylolæmus peripateticus, Karsch.

Distribution.—Tripoli.

The type and only specimen of this genus is in the Berlin Museum. It is in very poor condition, but does not possess the abnormal characters which might be inferred from the figures cited above. Its affinities are doubtless with the Notiphilidæ, and it does not appear to coincide with any of the genera. In certain of its external characters it suggests *Pectiniunguis*. No examination of the mouth parts was possible.

[1] Meinert has also described a "*Himantarium tæniatum*, new species" (Myr. Mus. Haun., III, p. 149), which of course could not stand if *Notiphilus* is a synonym of *Himantarium*. This is either an oversight or a complete disregard of the principle of priority.

[2] System der Myriapoden, p. 180, 1847; Die Myriapoden, II, p. 59, fig. 181.

[3] Verzeichniss der von Herrn E. v. Oertzen in den Jahren 1884 und 1885 in Griechenland und auf Kreta gesammelten Myriapoden. Berliner Entom. Zeitschr., XXXII, p. 220 (1888).

[4] Naturh. Tidsskr., VII, p. 32, 1879.

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Genus CHOMATOBIUS, Humbert and Saussure.

Chomatobius, HUMBERT and SAUSSURE, Revue et Mag. d. Zool., p. 205, 1870.

Type.—*Chomatobius mexicanus* (Saussure).[1]

Distribution.—Mexico.

DISARGIDÆ, new family.

Antennæ filiform or crassate, not attenuate; frontal lamina distinct (or coalesced?); cephalic lamina concealing the prehensors; prebasal lamina obsolete; basal plate broad; mouth parts unknown; prehensorial sternum very broad; supra-scutella wanting; ventral pores in two areas, a circular anterior and a broad, transverse posterior; anal pleuræ inflated, with numerous pores; anal pores wanting; genital palpi two-jointed; anal legs five or six jointed, with a claw. Pairs of legs, 59–99.

DISARGUS, new genus.

Type.—*Himantarium* (?) *striatum* (Pocock).[2]

Distribution.—Madras.

Genus HIMANTOSOMA, Pocock.

Himantosoma, POCOCK, Ann. d. Mus. Civ. di Genova, 2 ser., X, p. 428, 1891.

Type.—*Himantosoma typicum*, Pocock.

Distribution.—Mergui Archipelago, Burmah.

Besides these genera there are probably two or more others in the oriental region represented by species described by Meinert and Pocock under *Himantarium*, but evidently very little related to *gabrielis*. The characters now known are not sufficient, however, to give much base for an estimate of affinities. The present family has been recognized on account of the unique combination of characters which make affinities with the other families very improbable, though much must depend on the mouth parts.

BALLOPHILIDÆ, new family.

Antennæ geniculate, subclavate; frontal lamina not distinct; cephalic lamina concealing the prehensors; prebasal lamina obsolete; basal very broad; labrum entire, not chitinous; mandibles with one pectinate and one dentate lamella; labial sternum entire, simple; labial palpus two-jointed; interior labial process distinct; maxillary sternum divided; claw of maxillary palpus excavate, the margin pectinate; prehensorial sternum very broad, chitinous lines wanting; suprascutella wanting; ventral pores in an oval posterior area, consisting of a raised, perforated, chitinous plate; anal pleuræ not inflated, with two

[1] Essai d'une Faune d. Myr. d. Mex., p. 132, 1860.

[2] Ann. Mag. Nat. Hist., (6) V, p. 248, pl. XII, fig. 4.

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large pores more or less concealed; anal pores present; genital palpi; anal legs strongly crassate, six-jointed, without claw. Pairs of legs, 63–73 (87–91 in *Mesocanthus*).

BALLOPHILUS, new genus.

Type.—*Ballophilus clavicornis*, Cook, new species, in the National Museum collection.

Distribution.—Upper Guinea.

Genus MESOCANTHUS, Meinert.

Mesocanthus, MEINERT, Nat. Tidsskr., VII, p. 34, 1870.

Type.—*Mesocanthus albus*, Meinert.

Distribution.—Tunis.

This genus is assigned to the present family provisionally, and the family description was not arranged to contain it. According to Meinert's description and plates, there is great similarity with *Ballophilus* in the labrum. The mandibles are strikingly different from those of *Orya* and *Orphnœus*, the other forms with several pectinate lamellæ, and the ventral pores are in a single area. Seliwanoff has described a species with pleural pores.

Genus TÆNIOLINUM, Pocock.

Tœniolinum, POCOCK, Journ. Linn. Soc., XXIV, p. 471, 1893.

Type.—*Tœniolinum setosum*, Pocock.

Distribution.—St. Vincent.

SCHENDYLIDÆ, new family.

Antennæ filiform; frontal lamina coalesced; cephalic lamina not concealing the prehensors; prebasal lamina evident or concealed; basal lamina narrow; labrum entire, free or coalesced; mandibles with one pectinate and 1–3 dentate lamellæ; labial sternum entire, simple, or with a process; labial palpus two-jointed, with a process; interior labial process distinct or united with palpus at base; maxillary sternum entire; claw of maxillary palpus simple or pectinate; prehensorial sternum moderately broad; chitinous lines present or wanting; suprascutella wanting; ventral pores in a median area or wanting; anal pleuræ not much inflated, with few or many pores; anal pores wanting; genital palpi entire; anal legs five or six jointed, with or without claw. Pairs of legs, 39–71.

Genus SCHENDYLA, Bergsoe and Meinert.

Schendyla, BERGSOE and MEINERT, Naturh. Tidsskr., IV, p. 103, 1866.

Type.—*Schendyla nemorensis* (C. L. Koch).[1]

Distribution.—Europe; North Africa; Eastern North America.

[1] Deutschl. Crust. u. Myr., Hft. 9, t. 4, 1837.

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Genus PECTINIUNGUIS, Bollman.

Pectiniunguis, BOLLMAN, Proc. U. S. Nat. Mus., XII, p. 212, 1889.

Type.—*Pectiniunguis americanus*, Bollman.

Distribution.—Lower California.

Genus ESCARYUS, Cook and Collins.

Escaryus, COOK and COLLINS, Proc. U. S. Nat. Mus., XIII, p. 391, 1890.

Type.—*Escaryus phyllophilus*, Cook and Collins.

Distribution.—Central New York.

Genus NANNOPHILUS, new name.

Nannopus (BOLLMAN), COOK and COLLINS, Proc. U. S. Nat. Mus., XIII, p. 389, 1890.

Type.—*Nannophilus eximius* (Meinert).[1]

Distribution.—North Africa.

CTENOPHILUS, new genus.

Type.—*Ctenophilus africanus*, new species, Cook, in the National Museum collection.

Distribution.—Liberia.

DIGNATHODONTIDÆ, new family.

Antennæ filiform or subclavate; frontal lamina distinct or coalesced; cephalic lamina concealing the prehensors; prebasal lamina present or obsolete; basal lamina broad; labrum tripartite, the lateral parts greatly reduced; mandibles with a single pectinate lamella; labial sternum deeply bilobed, simple; labial palpus one-jointed, simple; interior labial process present or obsolete; maxillary sternum entire; claw of maxillary palpus rudimentary; prehensorial sternum not broad; chitinous lines present; suprascutella wanting; ventral pores in a median area or wanting; anal pleuræ not greatly enlarged, pores few or many; anal pores present or wanting; genital palpi simple, or two-jointed. Pairs of legs, 55–154.

Genus DIGNATHODON, Meinert.

Dignathodon, MEINERT, Naturh. Tidsskr., VII, p. 36, tab. 2, figs. 13–22, 1870.

Type.—*Dignathodon microcephalum* (Lucas).[2]

Distribution.—South Europe; North Africa.

Genus HENIA, C. L. Koch.

Henia, C. L. KOCH, System der Myriap., p. 83, 1847.

Type.—*Henia devia*, C. L. Koch.

Distribution.—Greece.

The genus *Scotophilus*, Meinert, was described without reference to *Henia*. Pocock has pointed out that the two genera are the same, and

[1] Naturh. Tidsskr., VII, p. 57, 1870.

[2] Explor. Scient. d. l'Algérie, p. 349, pl. II, fig. 10.

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that *Scotophilus* is preoccupied. Bollman has proposed the generic name *Meinertia* to take the place of *Scotophilus*, but this can not be used unless *devia*, the type of *Henia*, and *bicarinatus*, the type of *Scotophilus*, prove not to be congeneric. This is not impossible, for Koch's species is credited with 154 pairs of legs, while *bicarinatus* has only about half as many.

Genus CHÆTECHELYNE, Meinert.

Chætechelyne, MEINERT, Naturh. Tidsskr., VII, p. 44, 1870.

Type.—*Chætechelyne vesuviana* (Newport).[1]

Distribution.—South Europe; North Africa.

Family GEOPHILIDÆ, Leach.

Geophilidæ, LEACH, Trans. Linn. Soc. London, XI, pt. II, p. 384, 1814.

Antennæ filiform; frontal lamina distinct or coalesced; cephalic lamina not concealing the prehensors; prebasal lamina present or obsolete; basal lamina narrow; labrum tripartite. Mandibles with a single pectinate lamella; labial sternum entire or bifid, simple or with a process; labial palpus two-jointed, simple, or with a process; interior labial process usually distinct; maxillary sternum entire or divided; claw of maxillary palpus not excavate or pectinate; prehensorial sternum narrow, chitinous lines present or wanting; suprascutella wanting; ventral pores on posterior half of segments, not in a definite area; anal pleuræ more or less inflated, pores few or many; anal pores present or wanting; genital palpi two-jointed. Pairs of legs, 31–109.

Genus GEOPHILUS, Leach.

Geophilus, LEACH, Trans. Linn. Soc. London, XI, pt. II, p. 384, 1814.

Type.—*Geophilus carpophagus*, Leach.

Distribution.—Europe; North Africa.

Genus MECISTOCEPHALUS, Newport.

Mecistocephalus, NEWPORT, Proc. Zool. Soc. London, p. 178, 1842.

Type.—*Mecistocephalus attenuatus* (Say).[2]

Distribution.—Eastern North America; Europe; North Africa.

Genus ORINOPHILUS, new name.

Orinomus, ATTEMS, Sitzungsb. d. Kais. Akad. d. Wissens. Wien, CIV, p. 166, 1895.

Type.—*Orinophilus oligopus* (Attems).[3]

Distribution.—Austria.

[1] Trans. Linn. Soc., XIX, p. 435.

[2] Journ. Acad. Nat. Sci. Phila., II, p. 114.

[3] Sitzungsber. K. Akad. Wiss. Wien, CIV, p. 167, pl. I, fig. 11.

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SCHIZOTÆNIA, new genus.

Type.—*Schizotænia prognatha*, new species, in the National Museum collection.

Distribution.—Liberia.

PIESTOPHILUS, new genus.

Type.—*Piestophilus tenuitarsis* (Pocock).[1]

Distribution.—Dominica.

Genus LINOTÆNIA, C. L. Koch.

Linotænia, C. L. KOCH, System der Myriapoden, p. 86, 1847.

Type.—*Linotænia crassipes* (C. L. Koch).[2]

Distribution.—Europe.

Genus TOMOTÆNIA, Cook.

Tomotænia, COOK, American Naturalist, XXIX, p. 866, 1895.

Type.—*Tomotænia parriceps* (Wood).[3]

Distribution.—California.

Genus AGATHOTHUS, Bollman.

Agathothus, BOLLMAN, Bull. 46, U. S. Nat. Mus., p. 166, 1893.

Type.—*Agathothus gracilis* (Bollman).[4]

Distribution.—Tennessee.

Of the affinities of this genus little can be asserted. It is placed here mostly because Bollman originally described the species as a *Scolioplanes*.

Family DICELLOPHILIDÆ, Cook.

Dicellophilidæ, COOK, Proc. U. S. Nat. Mus., XVIII, p. 61, 1895.

Antennæ filiform or subattenuate; frontal lamina always distinct; cephalic lamina narrow, not concealing the prehensors; prebasal lamina obsolete; basal lamina very narrow; labrum tripartite, entirely free; mandibles with several pectinate lamellæ; labial sternum divided, simple; labial palpus and interior labial process similar in shape, distinct, apically spatulate; maxillary sternum entire; maxillary palpus slender; claw simple; prehensorial sternum very narrow, without chitinous lines; suprascutella wanting; ventral pores wanting; anal pleuræ inflated, with numerous pores; anal pores present; genital palpi usually two-jointed; anal legs slender, six-jointed, without claw. Pairs of legs constant for each species; in the different species, 43–101.

[1] Ann. and Mag. Nat. Hist., 6 ser., II, No. 12, p. 472, 1888.

[2] Deutschl. Crust. und Myriap., Pt. 3, tab. 3, 1835.

[3] Journ. Acad. Nat. Sci. Phila., V, p. 49, 1863.

[4] Ann. N. Y. Acad. Sci., p. 110, 1887.

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Genus DICELLOPHILUS, Cook.

Dicellophilus, Cook, Proc. U. S. Nat. Mus., XVIII, p. 61, 1895.

Type.—*Dicellophilus limatus* (Wood).[1]

Distribution.—California.

Genus LAMNONYX, Cook.

Lamnonyx, Cook, Proc. U. S. Nat. Mus., XVIII, p. 61, 1895.

Type.—*Lamnonyx leonensis*, Cook.

Distribution.—Sierra Leone.

Genus MEGETHMUS, Cook.

Megethmus, Cook, Proc. U. S. Nat. Mus., XVIII, p. 61, 1895.

Type.—*Megethmus microporus* (Haase).[2]

Distribution.—Philippine Islands.

GENERA NOT NOW RECOGNIZED AS VALID.

ARTHRONOMALUS, Newport.

Type.—*Arthronomalus longicornis* (Leach) = Geophilus longicornis, Leach.

CLINOPODES, C. L. Koch.

Type.—*Clinopodes flavidus*, C. L. Koch = Geophilus flavidus (C. L. Koch).

GEOPHILUS, Newport (not Leach).

Type.—*Geophilus acuminatus*, Leach = Linotænia acuminata (Leach).

MECISTOCEPHALUS, Meinert (not Newport).

Type.—*Mecistocephalus carniolensis* (C. L. Koch) = Lamnonyx carniolensis (C. L. Koch).

MEINERTIA, Bollman = SCOTOPHILUS, Meinert.

NECROPHLŒOPHAGUS, Newport.

Type.—*Necrophlœophagus longicornis* (Leach) = Geophilus longicornis, Leach.

NOTIPHILUS, C. L. Koch.

Type.—*Notiphilus tæniatus*, C. L. Koch = Bothriogaster tæniatus (C. L. Koch).

PACHYMERIUM, C. L. Koch.

Type.—*Pachymerium ferrugineum* (C. L. Koch) = Mecistocephalus attenuatus (Say).

POABIUS, C. L. Koch.

Type.—*Poabius niteus*, C. L. Koch = Geophilus flavidus (C. L. Koch).

[1] Journ. Acad. Nat. Sci. Phila., V, p. 42, 1863.

[2] Abh. u. Ber. d. K. Zool. u. Anth.-Ethn. Mus., Dresden, 1886–87, No. 5, p. 106.

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POLYCRICUS, Saussure and Humbert.

Described as a subgenus of *Geophilus*.

SCNIPÆUS, Bergsoe and Meinert.

Type.—*Scnipæus foveolatus*, Bergsoe and Meinert = Geophilus foveolatus (Bergsoe and Meinert).

SCOLIOPLANES, Bergsoe and Meinert.

Type.—*Scolioplanes maritimus* (Leach) = Linotænia maritima (Leach).

SCOTOPHILUS, Meinert.

Type.—*Scotophilus bicarinatus*, Meinert = Henia bicarinata (Meinert).

STENOTÆNIA, C. L. Koch.

Type.—*Stenotænia linearis*, C. L. Koch = Geophilus linearis (C. L. Koch).

STRIGAMIA, Gray = GEOPHILUS, Leach.

STRIGAMIA, Wood.

Type.—*Strigamia acuminatus* (Leach) = Linotænia acuminata (Leach).

STRIGAMIA, Seliwanoff.

Type.—*Strigamia parviceps*, Wood = Tomotænia parviceps (Wood).

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DESCRIPTION OF A NEW SPECIES OF GOLDEN BEETLE FROM COSTA RICA.

By MARTIN L. LINELL,
Aid, Department of Insects.

AMONG a small lot of Costa Rican Coleoptera recently presented to the United States National Museum by Mr. John Keith, of San Jose, Costa Rica, through Capt. G. P. Scriven, U. S. A., there were three specimens of the magnificent golden and silvery beetles from that locality. One of these I have identified as *Plusiotis resplendens* of Boucard, a true *Plusiotis;* the second one as *P. chrysargyrea* of Sallé, a species intermediate between *Plusiotis* and *Pelidnota* as regards the mandibles, the only structural character separating these two genera. The third specimen, which is described below, strictly belongs to *Pelidnota*, since it has the mandibles as distinctly bidentate as in the majority of species of this genus, but it would evidently be wrong to separate it from association with the species of *Plusiotis* inhabiting the same region, which it resembles so much in form and coloration. Its nearest ally seems to be the above-mentioned *Plusiotis chrysargyrea*, which it approaches in form, although having a still broader thorax. The species is readily distinguished from any form of the group hitherto described, both in coloration and elytral sculpture.

PLUSIOTIS KEITHI, new species.

Oblong, parallel, somewhat convex, above splendidly golden colored. Clypeus, front and a broad side margin of thorax, pinkish brown. A large purple spot at inner margin of eyes, and a line of same color on the thorax, separating the golden color of the disk from that of the side margin. Head rather coarsely punctured, with finer punctures intermixed. Clypeus rugose, almost semicircular, with strongly reflexed margin. Mandibles distinctly bidentate. Thorax at base nearly as broad as the elytra, sparsely and finely punctured at the middle, more densely at the sides. Elytra without striæ; sparsely covered with large, shallow, somewhat rugose punctures. Apical callus prominent. Sutural striæ impressed toward the apex. The finely rugose pygidium, the

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whole under-surface and the legs, of a pinkish brown with silvery reflections; all sutures shining cupreous. A line on inner margin of tibiæ and all the tarsi, rich purplish blue. Mesosternal process very long, conical.

Size.—Length, 30 mm.; width, 16 mm.

Type.—A single specimen in the National Museum collection.

Boucard, who has monographed the genus *Plusiotis*, has also studied these insects in nature during his travels in Central America. In regard to the habits of the golden and silvery species, he states that they feed in concealment during the day on the leaves of trees, especially young oaks. Just before sunset they take wing for a short time. Their period of life is very brief, and their habitat is extremely restricted. How difficult it is for collectors to obtain them may be better understood by citing his own words, narrating one of his visits to these regions. He says: "I was in Costa Rica in the proper season and at the exact locality where these insects are found, but was not able to get more than three specimens, although I offered a high price for them to the natives and did myself all that possibly could be done. Everyone in the country knew what I meant, when I asked for golden and silvery beetles, but they did not procure any."

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TWO NEW SPECIES OF BEETLES OF THE TENEBRIONID GENUS ECHOCERUS.

By F. H. CHITTENDEN,
Assistant Entomologist, United States Department of Agriculture.

A STUDY of a series of specimens of the tenebrionid genus *Echocerus* in the National Museum, kindly placed at my disposal for the purpose by Prof. C. V. Riley, has led to the discovery of two species that are evidently undescribed. The following brief descriptions are presented in advance of a more extended paper which is to be published at an early date.

ECHOCERUS DENTIGER, new species.

Form rather slender, convex. Eyes comparatively feebly emarginate; canthus slightly foliaceous, hardly extending beyond the eyes at the sides. Antennæ rather short, closely jointed. Prothorax hardly broader than long, sides subparallel, slightly rounded anteriorly; anterior angles considerably produced, acute; base slightly narrower than elytra. Prosternum finely punctate; pro-episterna very coarsely and sparsely punctate. Scutellum short, much broader than long, broadly rounded posteriorly. Elytra strongly punctate-striate; sutural and adjacent striæ more or less deeply impressed. Ventral segments moderately coarsely punctured at the middle. Hind tarsi short, first joint hardly as long as the second and third together.

Male: Mandibular horns short, suberect; inner margin flattened, with a broad, irregularly serrate tooth reaching about two-thirds toward the apex; apices slender, acute and incurved, not approximate. Frontal tubercles very large and quite obtuse. Canthus not prominent, subacutely produced, reaching the base of the mandibular horns.

Female: Front feebly reflexed, not extending beyond the eyes at the sides.

Size.—Length, 2.7 to 3.6 mm.; width 0.7 to 1.1 mm.

Habitat.—Columbus, Texas; Cocoanut Grove and Crescent City, Florida (Schwarz); Allegheny, Pennsylvania (Hamilton); Ohio, Kentucky, and Illinois (Ulke).

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Types.—Three examples in the National Museum collection, from Columbus, Texas, and specimens in the collections of Messrs. E. A. Schwarz, Henry Ulke, and F. H. Chittenden.

ECHOCERUS RECURVATUS, new species.

Form depressed. Eyes large, rounded, rather coarsely granulate, feebly emarginate. Anterior angles of prothorax broadly rounded; base feebly bisinuate; basal fovea strongly marked. Pro-episterna densely rugosely punctate. Marginal elytral stria deeply impressed. Ventral segments finely and densely punctured at the middle.

Male: Mandibular horns long, slender, simple, ascending and convergent from the base, recurved and contiguous at the apices. Front strongly concave, posteriorly with an arcuate ridge, forming at each side just above the inner margin of the eye an obtuse tubercle, and medially a small, elevated, more or less dentate or sinuate lamina. Canthus small, broadly rounded anteriorly, not contiguous to the horns.

Female: Clypeus subtruncate, separated from the front by a deeply impressed line. Prosternum sparsely punctate and shining.

Size.—Length, 2.9 to 3 mm.; width 0.9 to 1.2 mm.

Habitat.—Florida: Key West (Morrison, Schwarz), Metacombe Key (Ashmead).

Types.—Three examples in the National Museum, from Metacombe Key, Florida, and specimens in the collections of Messrs. Schwarz, Chittenden, and W. H. Ashmead.

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EAST AFRICAN DIPLOPODA OF THE SUBORDER POLYDESMOIDEA, COLLECTED BY MR. WILLIAM ASTOR CHANLER.

By O. F. Cook.

THE COLLECTION which is the occasion of this report is a small one, but the forms included are very interesting, and after a comparison with the types preserved in the Berlin Museum all seem to be new. In attempting to place the species generically, it has been found that the East African genera are mostly distinct from those to which species from that region have been referred by previous writers. The present collection furnishes representatives of but three genera, of which complete descriptions are here attempted. Notices of other African genera are included in the synopses, drawn partly from a considerable collection of African Polydesmoidea belonging to the Berlin Museum. This has seemed desirable in order to better define and show the affinities of the genera established on the specimens belonging to the United States National Museum.

The Polydesmoidea thus far known from East Tropical Africa are comprehended in three families, one of which seems peculiar to that region. East Africa is either strikingly deficient in family types, or very careful collecting has not been done, as may be judged from the table of African families here presented, of which six have been found in West Africa and only three in East Africa.

It is a noteworthy fact of distribution that no species of this suborder is known to be common to the east and west coasts of Tropical Africa, and what is more remarkable, no genus is common to the two sides of the continent except in the cosmopolitan family Strongylosomatidæ. That future discoveries may modify these facts is of course probable, for the number of African genera and species will doubtless be increased indefinitely. The larger and more conspicuous forms, however, have been collected quite extensively, and the personal opportunities of the writer warrant him in the opinion that no species closely related to those known from East Africa exist in Liberia, or indeed in the neighboring regions, from Cape Verde down.

The literature of the East African Polydesmoidea is not extensive, and is much scattered. For convenience of reference, uniformly

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arranged translations of the original descriptions of all the species have been added and the figures redrawn, except in some cases where they are so imperfect as to be of no use in identification. Hence the present paper may claim to be a monograph of the East African Polydesmoidea as complete as is now practicable.

The notes and drawings of the species in the Berlin Museum were made during a visit in May of the present year, twelve months after the work on the material collected by Mr. Chanler had been completed. The Berlin Museum contains all the types of East African Polydesmoidea thus far described. A new species, *Orodesmus forceps*, is described, at the request of Mr. Pocock, from a specimen in the British Museum; as this was the only mature male of the genus then accessible, Mr. Pocock's kindness gave the opportunity of completing the generic description.

ANALYTICAL KEY TO THE TROPICAL AFRICAN FAMILIES OF POLYDESMOIDEA.

Body minute, contractile into a completely closed sphere, in which the head and first segment are included between the decurved lobes of the enormously enlarged second segment: Family AMMODESMIDÆ, type *Ammodesmus granum*.

Body small to large, not capable of being more than spirally coiled; second segment not specially enlarged.....

Last segment rudimentary, included and concealed by the penultimate; first segment clypeate, entirely concealing the head; segments densely setose, and with large processes or coarse tubercles; repugnatorial pores on special stalks or lobes: Family STYLODESMIDÆ, type *Stylodesmus horridus*.

Last segment not concealed; first segment short or flabellate; repugnatorial pores not on stalks or special lobes.....

Carinæ strongly decurved; body capable of being coiled into a close spiral; dorsum roughened with clusters of large tubercles or numerous longitudinal carinæ: Family CAMPODESMIDÆ, type *Campodesmus carbonarius*.

Carinæ distinctly horizontal; body not capable of being closely coiled .....

Carinæ very broad, without thickened margins; repugnatorial pores remote from the lateral margin, located in the anterior part of the subsegment; head concealed under the expanded first segment: Family CRYPTODESMIDÆ, type *Cryptodesmus olfersii*.

Carinæ, if well developed, with a distinct thickened margin or intramarginal ridge bearing the repugnatorial pores; head not concealed .....

Anterior legs of males with a fleshy sole at apex, immediately above the claw; sternum of sixth segment of males with one or two large processes; fifteenth or sixteenth segments of males sometimes with sternal processes; penultimate segment very short; dorsum smooth, with no traces of granules or tubercles: Family GOMPHODESMIDÆ, type *Gomphodesmus castaneus*, Berlin Museum.

Anterior legs of males without fleshy soles; no processes from the sterna of the sixth and fifteenth segments .....

Lateral surface of segments smooth above the bases of the legs, with distinct longitudinal or oblique carinæ; body slender; dorsum smooth; lateral carinæ small: Family STRONGYLOSOMATIDÆ, type *Strongylosoma pallipes*.

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Lateral surface more or less beset with conic tubercles; above the bases of the legs two gradually rounded prominences, densely tuberculate: dorsum nearly always tuberculate or granular; carinæ distinct; Family OXYDESMIDÆ, type *Oxydesmus flavomarginatus*, Berlin Museum.

ANALYTICAL KEY TO THE GENERA OF GOMPHODESMIDÆ.

Antennæ with ten olfactory cones, arranged in a circle: Genus *Astrodesmus*, type *A. stellifer*.

Antennæ with four olfactory cones, as in all other Polydesmoidea.....

Sternum of fifteenth segment of male with a broad triangular ensiform process: Genus *Aulodesmus*, type *A. mossambicus*, Berlin Museum.

Sternum of fifteenth segment without process.....

Repugnatorial pores 11, segments 11 and 14 without pores: Genus *Marptodesmus*, type *M. chanleri*.

Repugnatorial pores 13; segments 11 and 14 provided with pores.....

Sterna of fifth and sixth pairs of male legs each with two distinct processes, those of the sixth much larger; genitalia not strongly curved, pluridentate: Genus *Harmodesmus*, type *H. nitens*, Berlin Museum.

Sternum of sixth segment with a single conspicuous median process, that of the fifth unarmed; apical portion of the genitalia strongly recurved upon the basal and produced into a slender flexuous flagellum.....

Sternal process of sixth segment of male narrow, bidentate; sternum of sixteenth segment with an abrupt verruciform process on the middle of the anterior edge, directed ventrad: Genus *Tycodesmus*, type *T. medius*, Berlin Museum.

Sternal process of sixth segment of males broad, unidentate; sternum of sixteenth segment unmodified.....

Body large, 60–70 mm.; preanal scale with setiferous tubercles greatly enlarged in both sexes, much exceeding the median angle; sterna of seventh and eighth segments of males with a distinct flattened process at the base of each leg of the posterior pair: Genus *Gomphodesmus*, type *G. castaneus*, Berlin Museum.

Body small, 20 mm.; preanal scale with median angle much more prominent than the setiferous tubercles; sterna of seventh and eighth legs without process: Genus *Sphenodesmus*, type *S. rugulosus*, Berlin Museum.

ASTRODESMUS,[1] new genus.

Eurydesmus pro parte, of PETERS, GERSTÄCKER, and KARSCH, not of SAUSSURE.

Diagnosis.—Body very large.

Antennæ with ten olfactory cones.

Segments dorsally smooth.

Lateral carinæ medium, margins thickened, entire.

Repugnatorial pores 13, dorsal on the thickened margins of segments 5, 7, 9–19.

Penultimate segment very short, surpassed by segment 18.

Last segment very short, triangular, the apex narrow.

Sterna with transverse medianly interrupted ridges.

Sternum of segment 6 of male with a large process.

[1] The name alludes to the peculiar conformation of the apical joint of the antenna.

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Sternum of segment 15 of male with a broad process.

Male legs crassate and inferiorly tuberculate, the first six pairs with a fleshy sole at apex.

Description.—Body very large, about five times as long as broad, cavity scarcely depressed; oblong, abruptly narrowed at both ends.

Vertex smooth, sulcus distinct, meeting a transverse inter-antennal sulcus; post-antennal depression deep, the sense organ large.

Labrum not emarginate, with three short, blunt teeth.

Antennæ filiform, joints in order of length 2, 4, 5, 3, 6, 1, 7. Seventh joint broader than long, truncate, and with a conic depression in its apical face; ten olfactory cones arranged in a circle around the edge of the depression.

Mandibulary stipe with exposed surface divided by sutures into five areas, the basal larger than all the others together.

Hypostoma strongly arcuate; rising from each side of the convex median portion is a flattened, oblong process lying against depressions of the lower part of the mentum.

Cardo present, transversely oval.

Mentum broadly triangular, long-pointed in front, very broadly emarginate behind, hirsute.

Stipes over twice as long as broad (2:5) hirsute.

Lingual laminæ three times as long as broad, hirsute. Lingual lobes large. Median lobe not evident.

First segment three times as broad as long, with anterior and posterior margins medianly straight and parallel; posterior margin laterally curved forward; anterior corners broadly rounded, the posterior nearly a right angle. The segment is much broader than the head, very slightly narrower and noticeably longer than the second segment.

Segments with dorsal surface smooth, neither granular nor areate.

Lateral carinæ subapproximate, about one-fourth as wide as the body cavity, inserted about three-fourths of the distance up; margin abruptly raised and thickened above, especially the lateral; edge blunt, entire; carinæ of anterior segments curved slightly forward, the posterior with posterior corners more and more produced.

Repugnatorial pores small, dorsal, located in a slight depression of the middle of the thickened margins of the lateral carinæ of segments 5, 7, 9–19, surrounded by a fine raised rim.

Below the carinæ the segments are finely rugulose, with a small longitudinal carina above the insertion of the legs.

Anterior subsegments smooth.

Supplementary margin long, membranous, finely striate longitudinally, not pectinate.

Penultimate segment very short, included between the projecting corners of the antepenultimate.

Last segment very short, triangular, the apex narrow, truncate or rounded, the whole segment bearing 16 setæ, as follows: Two pairs lateral, two pairs marginal, two pairs dorsal; all these upon larger or

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smaller tubercles; one pair apical and one subapical; these last rising from punctations.

Anal valves with compressed, elevated margins and two setigerous tubercles, the upper placed on the outer slope of the raised margin, the lower somewhat removed from it.

Preanal scale semielliptic-triangular, tricuspidate, the three projections close together, the middle flat, the others conic, blunt, with piliferous punctations at apex.

Sterna with a sharp, transverse, medianly interrupted ridge between the bases of each pair of legs; between the ridges a transverse furrow.

Sternum of sixth segment of male with a three-cornered process projecting ventrad between the anterior pair of legs. Sternum of the fifteenth segment of male with a broadly ensiform process projecting cephalad from between the anterior pair of legs into a socket in the posterior part of the fourteenth.

Eighteenth segment with the pedigerous laminæ very narrow, especially the posterior, so that the legs project obliquely caudad over the preanal scale.

Legs of males long and crassate, the dorsal face of the second joint strongly inflated; all the joints more or less tuberculate on the ventral face and beset with bristles on the apical joints.

First six pairs of male legs with a fleshy sole at apex of the last joint, and the claw shortened.

First pair of legs of male six-jointed like the others; the coxæ long, approximate.

Second pair of male legs with the coxæ produced ventrad into a large process, in the depression of the flattened ventro-posterior face of which is the seminal opening.

Male genitalia with basal joint very small, flattened; distal joint very large, laterally compressed, tricarinate; ungual portion very long, complicate, thin, and compressed at base to form a flexible pseudo-articulation, above which it is inflated, then extended into a long, flexuous flagellum, very slender distally.

This genus is distinct from *Eurydesmus*, Saussure, in the oblong body, the dorsal pores, the unarmed sterna and femoral joints of the legs, the unarmed fifth segment of the males, the single process of the sixth segment, and that of the fifteenth segment; probably also in the 10 olfactory cones. The two genera probably have no close affinity, notwithstanding the agreement in pore arrangement, the only character of importance which they seem to possess in common.

Eurydesmus is confined, as far as known, to South America, and the indubitable generic distinctness of the African forms makes stronger the probability that the two continents have little in common in the way of Diplopoda. The present is probably one of many cases where more careful study will show that the Diplopod genera are more circumscribed in their distribution than has been generally supposed.

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ASTRODESMUS STELLIFER, new species.

(Pl. II, figs. 1-11; Pl. III, figs. 1-9.)

Vertex without hairs, polished and shining; sulcus distinct, meeting a transverse shallow sulcus (and suture) between the antennal sockets.

Clypeus smooth, even, excepting an oblique depression on each side and a few coarse punctations below.

Antennæ with basal joints very sparsely hairy, the distal gradually more hirsute.

Mentum hirsute over the posterior two-thirds of its surface.

Stipes densely hirsute, a broad depression along the lateral edge, especially distad.

Lingual laminæ very densely hirsute over their entire surface.

Segments dorsally apparently smooth, shining with a dull luster, uniformly covered with minute, irregular, indistinct, impressed lines and wrinkles, and very minutely and densely punctate. Posterior margins of all the segments more or less rough with fine longitudinal notches or very short wrinkles.

Anterior segments with the posterior subsegments slightly convex anteriorly in the middle; broadly emarginate on each side of the convexity.

Lateral carinæ about one-fourth as wide as the body cavity; margin abruptly raised and thickened above, the edge entire, blunt; anterior and posterior edges of carinæ with a distinct, though fine, raised margin, which does not extend across the segments. Anterior carinæ laterally curved slightly forward, the posterior corners at first right angles, gradually more produced, until on posterior segments the rounded projection is more than half as long as the posterior subsegment. On posterior segments the raised margin is gradually broader, until on the penultimate it occupies the entire carina.

Below the carinæ the segments are densely rugulose with fine, flexuous wrinkles; a small, subtuberculate, indistinct carina just above the insertion of the legs.

Anterior subsegments shining, very indistinctly marked with longitudinal impressed lines.

Last segment (see Pl. III, figs. 3 and 4) very short, triangular, the apex narrow, truncate, slightly rounded; superior lateral tubercle somewhat above the level of the carina of the nineteenth, the inferior somewhat below; the anterior tubercle near the sinuation, the posterior about half way between the anterior and the apex. The dorsal bristles close to the margin; apical piliferous punctations rather close together, the subapical somewhat farther apart; apex of segment thick.

Anal valves moderately inflated, with compressed elevated margins; rugulose, especially in the depressions.

Preanal scale with surface nearly smooth.

Sterna sparsely hirsute.

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Process of the sternum of the sixth segment somewhat quadrate in posterior view, narrower at base, then broader, then narrowed again to a mucronate apex. The apical faces hirsute with very long hairs. Posteriorly the process, and the sternum below it, is medianly deeply canaliculate; antically the process is straight, with fine, raised lateral margins.

Sternum of the fifteenth segment with the process naked, broadly ensiform, medianly grooved below. The process consists of an extension of the transverse ridge between the anterior pair of legs, and is directed cephalad into a depression between the posterior legs of the fourteenth segment. Between the posterior legs of the fifteenth segment is also a similar depression, but smaller, although the sixteenth sternum is in no way modified.

Legs of males hirsute with long bristles, especially on the distal joints. Tubercles confined to the ventral face and best developed on the fifth joint; on the posterior legs the tubercles of the other joints are small or rudimentary. Posterior legs more slender than the others, but not much shorter.

First legs of males with the sole less developed and the claw larger than on the five following legs.

Male genitalia (Pl. II, figs. 4–9).

Color in alcohol varying from dirty yellowish-white (bone color) to dark purplish-brown. The carinæ are always light, and the posterior margin of the posterior subsegment usually so, also the anterior subsegments, excepting a dark median line and a line on each side along the level of the carinæ. Posterior subsegments bordered all around with a fine margin of distinct brown. Legs and antennæ reddish-brown, especially the distal joints. First segment usually with a broad margin of light color all around.

Length, 65 mm.; width, 13 mm.

Type.—National Museum collection. Four mature males.

Locality.—Tana River, East Africa, between the coast and Hameye.

One aspect of the male genitalium of this species greatly resembles that of *Eurydesmus laxus*, Gerstäcker, as figured by Karsch, and the first inclination was to identify it with that species in spite of considerable discrepancies in Gerstäcker's description. These are, however, too grave to be reasonably ignored. Compared with most Polydesmidæ, the animal would be called very robust instead of slender. Gerstäcker's measurements, however, justify his statement. Neither is it loosely articulated nor slightly convex. The apex of the process of the sixth segment of the male is not a distinct knob, and the shape of the process does not suggest a spherical triangle. The process of the fifteenth segment is not on the "fourth from the last" pair of legs, but the eighth from the last, though in this respect it would not be surprising if a mistake has been made in the description.

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ASTRODESMUS LURIDUS, Karsch.

(Pl. IV, figs. 11, 12.)

Eurydesmus luridus, KARSCH, Troschel's Archiv f. Naturw., p. 43, 1881.

Segments convex, nearly smooth, the sides slightly rugulose.

Male genital appendages broad, somewhat compressed, pilose with long hairs, constricted in the middle; falciform process and tooth entirely wanting.

Color dirty testaceous; carinæ testaceous yellow; also a large subdisciform spot on the posterior margin of cariniferous segments, strongly narrowed at the sides.

Length, about 45 mm.; width, 11 mm.

Locality.—Mombassa. A male specimen collected by Hildebrandt is in the Berlin Museum.

"A species easily distinguishable from all others previously known by the dirty color and the yellowish spot of the cariniferous segments, and especially by the form of the male genitalia, presuming the (type) specimen to have been mature."

The genitalia of the type of this species were either broken off or the specimen was immature. In the Berlin Museum are a number of young *Astrodesmi* comparable with this species, but I have not seen the type.

AULODESMUS MOSSAMBICUS (Peters).

(Pl. III, figs. 17, 18; Pl. VI, figs. 1–3.)

Polydesmus mossambicus, PETERS, Monatsber. d. K. Preuss. Akad. d. Wiss., Berlin, p. 81, 1885.

Eurydesmus mossambicus, PETERS, Reise nach Mossambique, Zoologie, V, p. 533.

Body convex; vertex smooth, the sulcus distinct. Antennæ extending to the third segment, joints 3, 4, and 5 equal, the second slightly shorter, the sixth slightly longer, the seventh very short.

First segment narrow, the lateral angle rounded-triangular, the margin thickened. Segments smooth. Lateral carinæ quadrangular, the margin thickened, the anterior angle rounded, the posterior acute. Last segment triangular, rounded at apex, above with four wart-like prominences.

Preanaal scale tringular, tridentate at apex.

Length and breadth of adult 85 and 16 mm.; of young, 25 and 4 mm.

Locality.—Island of Mozambique, Cabaceira, Rios de Sena, Querimba.

This species was later described at greater length among the Myriapoda of Mozambique, as follows:

Body broader than high, convex.

Vertex with a fine sulcus.

Antennæ finely hirsute, of moderate length, reaching to the third segment when laid back; the basal and terminal joints are very short, the others gradually decreasing from the second to the sixth; the third, fourth, and fifth differing but little in length.

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First segment arched, the lateral angle rounded; the anterior margin straight, the posterior with a shallow emargination, and on account of this and the greater convexity of its posterior portion the segment appears somewhat narrowed in the middle. Submarginal ridge of the lateral margin gradually decreasing on the anterior and posterior margins. The surface of this segment, as well as that of the remainder of the body, shows under the microscope a very fine granulation.

Lateral carinæ descending in the direction of the dorsal curve, and making, in the contracted condition of the animal, a connected series, since the pointed and somewhat ascending posterior corner of each carina projects over the anterior rounded corner of the following segment.

Repugnatorial pores located in the middle of the marginal ridge, and as the ridge slopes obliquely downward the pores are distinctly visible from above as well as from the side.

Last segment apically pointed-triangular; on each side of the upper surface four more or less distinct wart-like prominences.

Preanal scale broadly triangular, posteriorly with three rounded points, of which the middle is the smallest.

Legs hirsute, rather strongly granular, but the second joint without a spine.

Sternum of sixth segment of males with a rather long, three-lobed process between the first pair of legs.

Sternum of the fifteenth segment of males with a pointed, anteriorly directed median process and a corresponding depression in the fourteenth segment.

Male genitalia with the basal joint very large.

Males with the dorsum slightly less convex and the antennæ slightly longer than in the females.

Young animals differing only in the more cylindrical body, the peculiar structures of the sixth, fourteenth, and fifteenth segments being well developed in young males.

Color of dorsum and antennæ dark reddish-brown; the carinae, ventral surface, and legs, brownish-yellow.

Length of largest specimens, 85 mm.; width, 16 mm.; of the young, 25 mm. and 4 mm.

Locality.—Dr. Peters says: "I found this species in rubbish heaps on the island of Mozambique and upon the peninsula of Cabaceira in the month of December, at Querimba in May, and also at Tette."

The animals which are referred to as young males are in the Berlin Museum, and belong to a distinct genus.

AULODESMUS OXYGONUS (Peters).

(Pl. III, figs. 10–14; Pl. VI, figs. 4–7.)

Eurydesmus oxygonus, PETERS, Reise nach Mossambique, Zoologie, V, p. 535.

First segment with a distinct oblique submarginal ridge, which appears to be separated from the posterior, slightly convex margin by a sharp corner.

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Lateral carinæ directed horizontally, so that the dorsum appears less convex than in *mossambicus*. The submarginal ridges and the posterior spinous pointed corner are more developed.

Sterna of sixth and fifteenth segments, male genitalia, and colors as in *mossambicus*.

Length, 55 mm.; width, 11.4 mm.

Locality.—Rios de Sena, near the Zambesi. Dr. Peters collected three male specimens, and at first considered them a variety of *mossambicus*.

AULODESMUS LAXUS (Gerstäcker).

(Pl. II; figs. 12, 13.)

Eurydesmus laxus, GERSTÄCKER, Decken's Reise, p. 518, 1873

Slender, loosely articulated, slightly convex.

Head and antennæ as in *A. oxygonus*.

Clypeus with a rounded swollen supra-labral ridge.

First segment longer and somewhat narrower, the posterior margin, as on the two following, without a fold-like thickening, from the median slope strongly decurved and directed cephalad. On this account the lateral margin is shorter and more oblique to the head. Without forming a corner, and merely with a slight curve, it merges into the anterior margin. The smooth ridges on the upper side of the lateral margins are, and even more in the second segment, markedly smaller than in *A. oxygonus*.

The flattened arch of the median part of the segments and the slight elevation of the carinæ as in *A. oxygonus*, although on the second and third segments the elevation of the carinæ is evidently shorter, resulting from the fact that the anterior margin passes into the lateral by a stronger curve.

Posterior segments with the carinæ more pointed and farther produced caudad than in *A. oxygonus;* the carinæ of the penultimate segment have the form of a small and lightly curved spine.

Last segment with the cylindrical apical part separated by a deep transverse furrow and truncate at apex.

Preanal scale without a median projection between the wart-like processes. Anal valves with smooth, swollen margins.

Posterior legs with two basal joints sparsely covered with small, wart-like prominences.

Sternum of sixth segment with an obliquely upright process almost in the form of a spherical triangle, with a well-defined shining brown terminal knob.

Sternum of the fourth from the last pair of legs with a flattened, longitudinally furrowed process, nearly equilaterally triangular, blunt-pointed, pitch-brown.

First and second joints of posterior legs of male only sparsely beset with small, wart-like prominences.

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Male genitalia noticeably broader than in *A. oxygonus*, on the inner margin near the base, more rounded, and hence appearing to be more nearly approximate.

Color of alcoholic specimen dirty testaceous yellow, the lateral ridges of the carinæ lighter and clearer yellow, and with the anterior and posterior margins brown. Margins on the median portion of the segments, antennæ, and legs more ferruginous.

Length, 78 mm.; width, 12⅓ mm.

Locality.—A single male specimen from Mombassa.

"Near *Eurydesmus oxygonus*, Peters, but noticeably larger and distinct on account of the posterior margins of the three first segments without fold-like thickenings; the first segment with the posterior margin decurved cephalad on the sides; the much smaller marginal ridges on the carinæ of the second segment, the longer and more pointedly attenuate carinæ of the three segments before the last, the sparsely and finely granulated basal joints of the posterior pairs of legs, etc."

Karsch's drawing of the genitalia of this species bears considerable resemblance to *Astrodesmus stellifer*. If there is really a process on the sternum of the seventeenth segment ("des viertletzten Beinpaares"), it would probably be necessary to establish another genus.

AULODESMUS COMPACTILIS (Gerstäcker).

Eurydesmus compactilis, GERSTÄCKER, Decken's Reise, p. 519, 1873.

Body short and stout, proportionally strongly arched, slightly shining.

Vertex with a fine, though sharp, median furrow; clypeus below more strongly contracted than in *A. laxus*, the curved line above the middle of the margin distinct, the part below densely punctate.

Antennæ somewhat more slender than in *A. laxus*.

First segment with anterior margin even, moderately arcuate, passing with the same curve into the lateral margins; posterior edge emarginate in the middle, and also on each side, so that the lateral corners are sharp and slightly produced caudad; marginal ridges smooth, linear, continued on the anterior margin and gradually narrowed.

Subsequent segments strongly arched dorsally. Second to fourth segments with an evident emargination on each side of the posterior edge.

Lateral carinæ small, below the middle height of the segments; on the anterior segments scarcely evident, but more pronounced from the fifth back, slightly arched, the posterior edge slightly more elevated. Marginal ridges of segments 2–4, also of 6 and 8, linear, more pronounced than on the first segment. Carinæ gradually larger from segment 10; from 14 with evident tooth-like projections beyond the posterior margin. Projection of segment 18 smaller than that of 17, that of 19 small, blunt-papilliform.

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Last segment with a distinct, fine, transverse furrow limiting the posterior caudal projection, which is short triangular, with a blunt, almost truncate, above swollen, apex, and has on each side a stout, wart-like knob. Both the knobs and the apex of the segment bear bristles.

Anal valves light gray, with smooth yellow margins. Preanal scale transversely subhexagonal, with small median knobs between the lateral wart-like prominences.

Second leg of the female with a long styliform process directed obliquely caudad and ventrad, and lying between the legs of the third pair.

Color in alcohol pale bone-yellow, with a light-brown posterior margin of the dorsal portion of the segments, and with more or less evidently brown posterior corners of the anterior and posterior carinæ. Antennæ and legs light ferruginous.

Length, 49 mm.; width, 10.5 mm.

Locality.—One mature female specimen and an immature male, collected at Mombassa.

The male specimen was 31 mm. long and 8 mm. broad, and had 19 segments. There was no trace of the button-like process of the coxa of the second leg, which bears the genital opening, nor of the processes of the pedigerous laminæ of the sixth and fourth from the last pairs of legs. In place of the not yet developed genitalia, between the coxæ of the legs of the seventh segment were two transversely quadrate cushion-like prominences.

As the mature male of this species is not known, it is not possible to determine its generic affinities. The peculiar processes of the coxæ of the second legs of the female indicate the probability that it constitutes a generic type.

TYCODESMUS FALCATUS (Karsch).

(Pl. III, figs. 15, 16.)

Eurydesmus falcatus, KARSCH, Troschel's Archiv f. Naturgesch., p. 43, 1881.

Segments somewhat convex, nearly smooth.

Carinæ rather broad and thick.

Male genital appendages compressed at base, strongly curved, distally provided with a stout, rather long spine; beyond this produced into a very long, slender, falcate structure, slightly bifid at apex.

Color uniform pale testaceous.

Length, about 40 mm.; width, about 8 mm.

Locality.—Seriba Ghattas. One male specimen, collected by Dr. Schweinfurth, preserved in alcohol in the Berlin Museum.

"A new species, distinct from *Eurydesmus mossambicus* and *oxygonus* in the simply curved falciform apical processes of the male genitalia." (Karsch.)

The genitalia of this species seem quite different from those of any other, and the species may prove to be generically distinct. For the present the size and habit seem to indicate affinity with *Tycodesmus*.

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SPHENODESMUS CAFFRARIUS (Porat).

Eurydesmus caffrarius, PORAT, Ofersigt af K. Vetensk. Akad. Forh., No. 5, p. 13, 1872.

Body strongly convex, glabrous above, setose below between the coxæ, scarcely attenuate posteriorly.

Head with very few setigerous foveæ. Vertex medianly longitudinally sulcate, subglabrous. Clypeus subglabrous, margin setose.

Antennæ shorter than the breadth of the body, 6 mm. long.

First segment with anterior margin laterally thickened, oblique, nearly straight or very slightly sinuate; posterior straight, sides curved forward, processes rounded.

Segments glabrous, nearly smooth, or irregularly coriaceous under a lens; lateral carinæ thickened, somewhat ascending posteriorly, anterior angle rounded, posterior slightly acute, slightly prominent, more acute on segments 16–19; ventral surface between segments 6 and 7 with a prominent triangular lamina.

Repugnatorial pores rather dorsal than lateral, placed a little behind the middle of the carina.

Last segment prolonged, apex truncate, transversely impressed near the apex; setæ few.

Anal valves margined, with two pairs of setæ. Preanal scale large, simple, or indistinctly trifid, the median lacinia far the longest; setigerous tubercles two.

Legs of pairs 1–6 with a pulvillus on the last joint; a triangular prominent lamina between segments 6 and 7.

Legs shorter than the breadth of the body, 5 mm.

Copulatory legs much protruding, spiral, setose, the external margin bidentate, with a lacinia near the inflexed apex.

Color of alcoholic specimens testaceous.

Length, 34 mm.; breadth, 6.5 mm.

Locality.—Caffraria.

This species is much larger than the type of the genus, and does not belong to the tropical fauna. From Porat's description, however, there seems to be no important point of difference from the present genus, except that the dorsum of *Sphenodesmus rugulosus* is somewhat roughened.

MARPTODESMUS,[1] new genus.

Diagnosis.—Body of moderate size.

Antennæ with four olfactory cones.

Segments dorsally smooth.

Lateral carinæ medium; margins thickened, entire.

Repugnatorial pores 11, dorsal on the thickened margins of segments 5, 7, 9, 10, 12, 13, 15–19.

Penultimate segment very short, surpassed by segment 18.

[1] The generic name has reference to the numerous secondary sexual characters.

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Last segment very short, triangular, the apex narrow.

Sterna spined at the base of each leg.

Sternum of segment 6 of male with two processes.

Sternum of segment 15 of male normal.

Male legs crassate and inferiorly tuberculate, the first six pairs with a large, fleshy sole.

Description.—Body of medium size, about four times as long as broad, oblong, very abruptly narrowed anteriorly, truncate posteriorly.

Vertex smooth, sulcus distinct; post-antennal sense organ very large, distinct from the antennal socket by less than half the diameter of the organ; post-antennal suture distinct; lateral margin subentire.

Labrum with shallow emargination and three small rounded teeth of moderate length; supralabral bristles very numerous.

Antennæ filiform, second joint longest; joints 2, 3, 4, 5, 6 subequal; olfactory cones four, arranged in a square.

Mouth parts probably as in the genus *Auledesmus*.

First segment three times as broad as long; anterior and posterior margins medianly straight and subparallel; lateral end rounded, the posterior corner broadly truncate, the anterior slightly so; the segment is much broader than the head, twice as long, and somewhat narrower than the exposed portion of the second segment.

Segments smooth and shining, without markings.

Lateral carinæ approximate, about one-fourth as wide as the body cavity, inserted half-way up; a fine raised margin broadest laterad, especially on poriferous and caudal segments.

Below the carinæ the posterior subsegments are finely and rather faintly striate longitudinally, somewhat prominent some distance above the insertion of the legs.

Anterior subsegments smooth and shining, with faint, irregular, impressed lines.

Supplementary margin short, longitudinally finely striate, not pectinate.

Repugnatorial pores opening subdorsally in a large, deep, rounded depression of the outer slope of an intramarginal ridge of segments 5, 7, 9, 10, 12, 13, 15, 16, 17, 18, 19.

Preanal segment very short; anal segment very short, the apical portion triangular, truncate at apex, and with four punctations there; twelve other punctations, ten located as in Pl. IV, fig. 6, and two others lower down on the sides, below the level of the carinæ (Pl. IV, fig. 7.)

Anal valves with strongly elevated margins; two setigerous punctations, the superior marginal, the inferior submarginal.

Preanal scale semielliptic, a broad, rounded, setigerous prominence on each side of the middle, which is not produced, but rather truncate.

Sterna broad, and densely hirsute, except the first and last.

Sternum of the fifth segment of male, with two large papilliform hirsute processes between the second pair of legs.

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Sternum of segment 6 with two similar processes between the anterior pair of legs

Sterna of post-genital segments of male with a stout, sharp, conical spine at the base of each leg, more pronounced on posterior segments and larger between the posterior pair of legs of each segment.

Sternum of segment 15 not different from its neighbors.

Legs of male crassate, hirsute, with long bristles, the joints in order of length 3, 2, 4, 5, 6, 1.

Second legs of male with the coxæ produced ventrad into a rounded-conic, somewhat recurved process; genital opening on the median face of the coxa, at the base of the process.

Seventh pair of legs with a broadly conic process on the apex of the inflated coxa, directed mesocephalad.

Pregenital legs of male with the distal joint supplemented at apex by a cushion-like process as long as the very slender claw.

Two distal joints of male legs roughened on the ventral face by papilliform tubercles, very large on postgenital legs.

Male genitalia with a broad basal joint; second joint incurved at base, ungual portion subequal in length with the other, slender, straight, bifid at apex.

This genus is remarkable in the number of secondary sexual characters, rivaling *Scytonotus* in that sort of specialization. Like *Scytonotus*, it appears to be very distinct from the related genera, though in habit the resemblance to *Aulodesmus* is very striking. Approximations in habit between members of widely different families are, however, too numerous among Diplopoda to warrant the inference of affinity except from a combination of the more constant structural characters. To indicate such an agreement for the present genus is not easy, but in spite of the difference in pore formula in the numerous secondary sexual characters no genus suggests itself as having more in common with the present than *Aulodesmus*, agreeing as it does in habit, mouth parts, the small basal joint of the male genitalia, and in the tuberculation and membranous sole of the anterior male legs.

In this genus the first segment is much more rounded laterally than in *Aulodesmus*, being without an apparent angle; the whole segment is more convex, making the ends more decurved; it is narrower in comparison with the second segment. It is, furthermore, not subemarginate toward the ends, as in *Aulodesmus*.

The greater convexity is shared by the entire body, which has the dorsum more arched and the carinæ more depressed than in *Aulodesmus*.

MARPTODESMUS CHANLERI, new species.

(Pl. IV, figs. 1–10.)

Vertex smooth and shining, sulcus transversely rugulose, not deeply; postantennal depression subvertically rugulose near the lateral margin.

Clypeus smooth and shining, a sharp, oblique depression parallel to the lateral margin, halfway between the margin and the antennal

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sockets; below, a few scattering bristles, gradually longer; supralabral bristles long and very numerous, a crowded row next the margin, otherwise without apparent arrangement.

Antennæ sparingly hirsute, the distal joints moderately so; basal joint bulbous, the others, except the last, obconic, with equal diameters; length 4.5 mm.; diameter, 0.25 mm.; length of second joint, 0.8 mm.

Mentum, stipes, and lingual laminæ densely hirsute with short hairs except distally; stipes and laminæ with long bristles along the margin.

First segment smooth and shining, a slight transverse depression in front of the middle; lateral ends with a fine raised margin. Medianly the segment is slightly and broadly emarginate.

Subsequent segments like the first, slightly broader and longer to the fifth; surface smooth and shining, very finely and regularly reticulate; areolate under sufficient magnifying power.

Lateral carinæ irregularly rugulose inside the raised margin, more especially on posterior segments; on the first four segments the posterior margin is curved forward, while on subsequent segments it is turned more and more caudad and produced into a conical point until the projection of the eighteenth segment exceeds the nineteenth segment in length (see Pl. IV, fig. 6).

Posterior segments with scattering longitudinal wrinkles above, the submarginal wrinkles more pronounced.

Anal segment above irregularly rugulose transversely; setigerous punctations very inconspicuous. No setæ were found, though their absence is probably accidental.

Anal valves not inflated, vertically rugose, the margins thick, raised, but not so strongly compressed as to be bounded by a definite furrow.

Preanal scale very thick, somewhat rugulose on the edge, mostly smooth and shining.

Sterna, especially the posterior, densely hirsute with fine, long hairs.

Processes of the sternum of the fifth segment of males straight, erect subspatulate, flattened cephalo-caudad, armed at base with a few long, divergent bristles; naked and nearly smooth distad.

Processes of the sixth segment similar in shape, armed with long bristles on their inner faces, otherwise naked; in size they are slightly larger than those of the fifth segment.

Legs of male crassate, more or less densely hirsute with very long hairs.

Coxæ of first pair of male legs approximate, moderately hirsute distad. Coxæ of second male legs somewhat separated, conically produced ventrad, and with irregular prominences caudad; naked except a few long bristles. Coxæ of third and subsequent legs widely separated, more or less hirsute. Coxæ of seventh legs of males prominent mesad, especially the anterior corner; these prominences, with the processes from the sternum, give protection to the genitalia.

Pregenital legs of male with the claw much reduced, and a white membranous or fleshy sole projecting nearly as far as the claw. This is

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doubtless to assist in grasping the female; the same contrivance is found among the smooth Iulidæ.

Postgenital legs of males with coarse, rounded, chitinous tubercles on the inner face of the apical joint; smaller tubercles also on the subapical joint.

Male genitalia simple, the basal joint very small, almost hidden under the expanded reniform base of the apical, which is densely hirsute on its median face, and has some especially long bristles at the base of the ungual portion. This last is bifid nearly half its length, the divisions subequal, one strongly falcate, the other oblique and less falcate.

Color in alcohol a faded light brown, the carinæ and ends of the anterior segments whitish. The posterior median part of each segment is lighter than the rest, except the carinæ, and the anterior part of the animal is lighter than the posterior. Legs and antennæ also light brown.

Length, 24 mm.; width, 6 mm.

Locality.—Tana River, East Africa.

Type.—One mature male in the National Museum collection.

SYNOPSIS OF AFRICAN GENERA OF STRONGYLOSOMATIDÆ.

Legs 4–6 of male with the third joint crassate and enlarged below into a distinct tuberculoid process: Genus *Cnemodesmus*, type *C. thysanopus* (Cook and Collins).

Third joint of male legs not specially modified.....

Dorsum slightly convex, the suture crenulate, carinæ well developed, all sharply produced at the posterior corners; legs and antennæ short; sterna broad, all unarmed: Genus *Orthomorpha*, type *O. coarctata* (Saussure).

Dorsum strongly convex, the suture not crenulate, carinæ inconspicuous, not produced except on a few subterminal segments; legs and antennæ long and slender; sterna narrow, especially the posterior of each segment of males; anterior sternum of fifth segment with one or two spinose processes.....

Males slender and with long antennæ and legs; females robust, antennæ and legs much shorter; sterna unarmed or slightly prominent, sternum of the fourth pair of legs with two distinct conic spines; coxæ of last pair of legs separated at base by at least the thickness of a leg; carinæ of all the segments distinct, slightly produced beyond the posterior margin on posterior segments: Genus *Habrodesmus*, type *H. lætus*.

Males and females subequal, both with very long legs and antennæ; sterna, especially the posterior of each segment, armed at the base of each leg with a distinct conic spine; sternum of fourth legs with a stout process, bidentate at apex; coxæ of last pair of legs almost in contact at base; carinæ represented by rounded elevations, not produced; those of segments 3, 4, 6, 8, 11, and 14 indicated only by the superior impressed line: Genus *Scolodesmus*, type *S. grallator*.

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HABRODESMUS HARTMANNI (Peters).

Strongylosoma hartmanni, PETERS, Monatsber. d. K. Preuss. Akad. d. Wiss. zu Berlin, p. 534, 1864.

"This beautiful species is, as regards the habit, the form of the carinæ, and the great length of the antennæ and legs, very close to *S. aculeatum*, but is distinct in the coloration. Head, the middle of the first and the greater part of the remaining segments reddish-brown or blackish-brown; the margin of the first segment, the posterior margin of the following segments, the carinæ, two spots on the anterior subsegments, and the apex of the last segment ocher yellow; antennæ dark brown, yellow at the articulations; legs and ventral surface grayish-brown." (Peters.)

Length, 27 mm.; width, 2.3 mm.

Locality.—Sennar. Three specimens in the Berlin Museum collected by Dr. Hartmann.

The following notes were made on the type specimens:

Closely related to the type of the genus. Segments with posterior broad yellow band and distinct transverse furrow.

Sterna of posterior legs of each segment with conical spines.

Antennæ rather long, but not so much as in *Scolodesmus*.

Genitalia ending in a spiral curve, but the point blunt and rounded.

HABRODESMUS ACULEATUS (Peters).

(Pl. V, figs. 6, 7.)

Strongylosoma aculeatum, PETERS, Monatsber. d. K. Preuss. Akad. d. Wiss. zu Berlin, p. 81, 1885.

Antennæ long.

Lateral carinæ triangular, reflexed, acute at posterior corner. Last segment rostriform.

Legs long, the third joint almost twice as long as the first and second taken together.

Color: head, antennæ, and dorsum vinaceo-fuscous; legs, venter, and the apices of the carinæ, pale yellow.

Segments, 20; pairs of legs, 31 (the three anterior segments with a single pair each).

Length of female, 25 mm.; antennæ, 4.5 mm.; last legs, 6.3 mm.; width of head, 2.2 mm.; width of body, 2.7 mm.

Locality.—Terra Boror, 18° south latitude. The type specimen is dried; it has the inferior carinæ and transverse dorsal sulcus distinct, and the last segment much projecting.

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ANALYTICAL KEY TO THE GENERA OF OXYDESMIDÆ.

Dorsum densely beset with several (5 to 6) transverse rows of coarse granules: Genus *Scytodesmus*, type *S. kribi*, Berlin Museum.

Dorsum nearly smooth, finely granular, or with three rows of polygonal areas, each with a large tubercle or granule in the middle.....

First three or four segments with one or more large tubercles or processes from the middle of the posterior margin: Genus *Orodesmus*, type *O. forceps*, British Museum.

Granules of third and fourth segments, if present, not conspicuously enlarged or coalesced into a process .....

Posterior subsegments faintly rugulose, apparently smooth and shining; no tubercles or granules; no trace of a transverse furrow: Genus *Mimodesmus*, type *M. parallelus*, Berlin Museum.

Posterior subsegments either tuberculate or granulate, and with a distinct transverse furrow .....

Apex of last segment broad, rounded, faintly emarginate, not exceeded by marginal tubercles: Genus *Oxydesmus*, type *O. flavomarginatus*, Berlin Museum.

Apex of last segment narrow, included in a distinct sinus between the posterior pair of marginal tubercles .....

Carinæ not distinctly margined, the pores located in a distinct depression, not in a bead-like, poriferous marginal callus: Genus *Isodesmus*, type *I. immarginatus*.

Carinæ distinctly margined, especially cephalad, and with a bead-like, poriferous marginal callus.....

Fourth segment slightly, though distinctly, narrower than the third and fifth; carinæ coarsely dentate along the posterior margin, somewhat areate dorsally: Genus *Anisodesmus*, type *A. cerasinus*.

Fourth segment equal to the others; carinæ entire, not areate: Genus *Tylodesmus*, type *T. crassipes*.

ORODESMUS,[1] new genus.

Oxydesmus, pro parte, of KARSH and PORAT.

Diagnosis.—Body moderately large.

Antennæ with four olfactory cones.

Segments dorsally granular-rugose, with three transverse rows of tubercles.

Segments 1–4 with some of the middle tubercles hypertrophied.

Lateral carinæ large, thin, more or less dentate at the lateral edge.

Repugnatorial pores 11, dorsal on the outer slope of the intramarginal ridge of segments 5, 7, 9, 10, 12, 13, 15–19.

Penultimate segment exceeding segment 18.

Last segment broad, subquadrate, the apex strongly dentate; superior lateral tubercle very large.

Sterna without spines, ridges, or processes.

Male legs somewhat crassate.

Male genitalia not flexed, free.

[1] The name alludes to the dorsal prominences.

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Description.—Body moderately large, about five times as long as broad, broadest about the fifth segment, tapering very gradually caudad, cavity circular.

Vertex prominent, rough; sulcus very deep.

Antennæ scarcely clavate; third joint nearly as long as second; joints in order of length 6, 2, 3, 4=5, 1, 7.

Mouth parts probably as in *Oxydesmus*.

First segment subcrescentic (shorter than in *Oxydesmus*), much broader than the head and slightly narrower than the second segment, with three transverse rows of distinct tubercles.

Segments with dorsal surface granular rugose; three transverse rows of conic tubercles, each (except on some anterior segments) located in a distinct area. Posterior row of areas oblong, the others rounded or subsquare.

Segments 1–4 with the two middle tubercles of the last row coalesced and hypertrophied into a large conic process bifid at apex, the neighboring granules sharing more or less in the elevation.

Lateral carinæ thin, inserted about three-quarters up, in width equal to about one-half the body cavity; anterior carinæ curved somewhat forward, the posterior with the corners more and more produced caudad. Margin more or less distinctly dentate or sinuate, with a distinct intramarginal ridge.

Repugnatorial pores opening dorsally in a depression between the margin and the intramarginal ridge of segments 5, 7, 9, 10, 12, 13, 15–19, surrounded by a fine raised rim.

Below the carinæ the posterior subsegments are more or less tuberculate along the margins and prominent above the insertion of the legs.

Anterior subsegments finely coriaceous.

Supplementary margin long, membranous, very finely striate longitudinally, not pectinate.

Last segment rugose on its posterior portion, which is broad and subquadrate; with three setigerous tubercles along the margin on each side of the truncate, minutely dentate apex. Two dorsal setigerous tubercles, two apical and two subapical. The lateral setigerous tubercles large, conic, especially the superior, which has the appearance of a carina.

Anal valves with two setigerous tubercles, the upper placed on the raised margin, the lower somewhat removed from it.

Preanal scale broadly triangular, with a prominent setigerous tubercle on each side near the apex.

Second pair of legs of male with the coxæ somewhat produced medianly.

Male genitalia rising from a small aperture; basal joint small, hirsute; apical portion large, twisted, complex, not inserted under the edge of the aperture as in *Oxydesmus*.

Segments of adult, 20.

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Locality.—East coast of Tropical Africa.

This genus has evident affinity with *Oxydesmus*; it may also be said that the two genera are more related to each other than either is to any third. They are, however, easily distinguishable by the curious processes of the first four segments of *Orodesmus*, the shape of its last segment, and the altogether different type of male genitalia, not to mention many minor or quantitative distinctions.

All the East African species described under *Oxydesmus* seem to have their affinities here rather than with the true Oxydesmi of the west coast.

ORODESMUS FORCEPS, new species.

(Pl. IV, figs. 13–16.)

Vertex prominent, rugose, with a very deep sulcus.

Antennæ scarcely clavate, sixth joint thickest; when the animal is extended the antennæ reach to the fourth segment.

First segment broadly emarginate in the middle posteriorly, and on each side of the middle anteriorly.

Segments 1–4 with the two middle granules of the posterior row coalesced and developed into a high conic process slightly bifid at apex. This process is inconspicuous on the first segment and largest on the fourth. Posterior part of fifth segment slightly more elevated than the following, the granules on each side and in front of the process partaking more or less in the elevation.

Segments with their dorsal surface finely rugulose, the impressed lines between the areas distinct.

Lateral carinæ sinuate denticulate, with a prominent intramarginal ridge, sinuate opposite the pores, straight on other segments.

Repugnatorial pores on the outer slope of the ridge, not facing directly upward.

Last segment somewhat transversely rugose above, the superior lateral tubercles increased into a long spine. Marginal tubercles prominent, the anterior acute, the second broad, the third not so near the margin as in the following species, projecting obliquely upward. Dorsal tubercles slightly behind a line which would connect the two anterior marginal. Apex medianly emarginate, bipunctate; two subapical setigerous punctations.

Preanal scale triangular, on each side of apex a rounded tubercle.

Male genitalia viewed from below appearing difform and contorted; an elevated narrow ridge on the inner side apically is impressed with transverse lines; lower down it crosses to the other side (Pl. IV, fig. 13). A side view shows (Pl. IV, figs. 14, 15) small basal and apical joints, with the ungual portion slender and pedicel-like below, bearing a somewhat dumb-bell-shaped structure with a long curved spine projecting ventrad (or cephalad) and the apical end deeply excavate, the ends connivent, resembling a pair of forceps, whence the specific name.

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Color very dark wine-red, slightly paler on the posterior part of the segments and carinæ.

Length, 42 mm.; greatest width, 8 mm.

Locality.—East Africa. One male specimen in the British Museum.

This species, rather than the following, is made the type of the new genus because the male is known. The two species are, however, closely related. From the above description some minor details are wanting which have been supplied in the case of the next species. In most of these the two species are more probably alike than different, but careful comparisons could not be made, for the descriptions were not made with both specimens at hand.

ORODESMUS BICOLOR, new species.

(Pl. V, figs. 8–14.)

Vertex without hairs, very prominent, densely rugose, the wrinkles somewhat longitudinal, below irregular and gradually becoming obsolete. A very deep and broad sulcus, the sides of which are rugose like the neighboring surface. Above and outside of the antennal sockets is a large oblique depression, in which the wrinkles are coarser, but not so dense. Post-antennal organ prominent, with a raised margin.

Clypeus shining and nearly smooth, very sparsely hirsute below, except just above the labrum, where a transverse furrow contains a row of hairs. A broad, rather deep, obliquely oval depression subparallel to the margin below and laterad from antennal sockets.

Labrum with a moderately deep three-toothed emargination, above which is a distinct transverse furrow with a row of very numerous, fine, decurved bristles.

Antennæ wanting.

Stipes of gnathochilarium hirsute with long hairs along the anterior and lateral margins.

First segment subcrescentic; medianly convex anteriorly and broadly emarginate on each side of the convexity; anterior corners broadly rounded, the posterior pointed, slightly less than a right angle. Lateral margins with three broad, rather indistinct teeth. Surface of segment granular rugulose, with three transverse rows each of four pointed conic tubercles, the surface about each somewhat elevated, but not divided into areas. The tubercles are confined to the middle of the segment, not extending to the carinæ; the first row, close to the anterior margin, is nearly straight, the tubercles close together, at equal distances, with the middle ones somewhat larger and slightly farther ahead than the others. The second row has the tubercles much wider apart, at equal distances, with the middle ones considerably ahead of the others, but not noticeably larger. The posterior row, close to the posterior margin, is somewhat shorter than the anterior, the two middle tubercles very close together, very much the largest of the segment, and somewhat behind those of the same row. Near the end of the carinæ is a well-pronounced ridge, starting from the posterior corner,

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regularly curved, anteriorly diverging from the margin. Around the entire segment is a well-defined, raised margin, broadest in front and broken into small, irregular teeth behind.

Second segment somewhat broader and much shorter than the first, subsimilar in general shape except that it is deeply and broadly emarginate in front instead of convex. There are three transverse rows, each of six tubercles, the two middle ones of the posterior row very close together, coalesced, forming a large subpyramidal apically bifid process. The middle tubercles of the second row are also close together, somewhat enlarged and forming a part of the large process, as do also the pair of tubercles of the third row neighboring to the middle ones. The raised margin of the segment is carried up on the process, leaving a somewhat concave posterior face below it.

Third segment slightly longer than the second, the process considerably larger, the two middle tubercles of the posterior row forming the apex, the next pair projecting about half way down the sides.

Fourth segment slightly longer than the third, the process somewhat smaller, about as high as that of the second segment, but broader.

Fifth segment noticeably longer than the fourth, the process entirely disappeared, the four middle tubercles of the last row equal and at equal distances, with an evident transverse sulcus in front. All the tubercles of this segment located in subquadrate or hexagonal areas more or less defined by furrows. A tendency to areation is also apparent in the preceding segments, but the difference between this and the fourth segment is very abrupt.

Subsequent segments similar; the tubercles becoming more numerous (8–12 in a row) and less elevated in middle segments, and again more prominent on the latter segments, especially along the posterior margin.

Penultimate segment with a row of ten sharp, conic, papilliform tubercles projecting upward and backward from its posterior margin. Surface of this and preceding segments more coarsely uneven than on middle segments, but still shining.

Lateral carinæ with three rather obscure teeth on segments 1–5; after that with three or four teeth. Intramarginal ridge gradually closer to the margin, until it becomes nearly obsolete on segments 11 and 14. On poriferous segments, however, it remains distinct, more or less arcuate opposite the pore; posterior corner of carina thickened, especially on posterior segments.

Repugnatorial pores on anterior segments located slightly behind the middle of the segment, nearer to the ridge than to the margin; on posterior segments the pores are gradually farther back, and in a deeper and deeper depression midway between the ridge and lateral margin.

Below the carinæ the segments are irregularly rugulose, becoming granular, coarsely tuberculate along both margins of the subsegment below; prominent above the insertion of the legs, and with two large long-pointed tuberculate processes, the anterior larger, directed

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obliquely ventro-cephalad. On posterior segments these processes nearly disappear, the tubercles being smaller and smaller and confined to a row along each margin, the posterior row extending nearly up to the carina.

Anterior subsegments apparently smooth, but not shining; very minutely punctate-coriaceous, with occasional indistinct longitudinal striæ.

Supplementary margin rather long, especially on middle segments, rather firm, faintly striate, not pectinate.

Last segment above anteriorly like the anterior subsegments, the projecting posterior portion separated by a gentle transverse depression or constriction, densely rugose, with eight well-pronounced tubercles, two on the upper surface and three along the margin on each side of the apex. The dorsal tubercles nearly on a transverse line between the posterior pair of marginal. The posterior pair of marginal tubercles directed somewhat upward. The apex itself is truncate, minutely four-dentate, or rather notched in the middle, and with a piliferous punctation on either side. A pair of subapical punctations somewhat farther apart than the apical, as in the species of *Oxydesmus*. On each side, below the level of the carinæ, two large, conic, setigerous tubercles, the superior larger, appearing like a carina to the last segment.

Anal valves moderately convex, with moderately elevated, but not compressed margins; the superior setigerous tubercle located on the margin about five-sixths of the way to the top; inferior tubercle rather distant from the margin about half way up. Surface of the valves irregularly or subvertically rugose, especially in the more depressed portions.

Preanal scale broadly triangular, thickened, with a prominent conic tubercle on each side, near the rounded apex, and not exceeding it. Surface very finely rugulose.

Sterna smooth and shining, only impressed between the legs of either side.

Color in alcohol dark vinous red, alternating with obscure pinkish. Head very dark vinous, nearly black, a spot above the antenna, and the labral region yellowish. Anterior segments somewhat lighter than the head, the carinæ and posterior crests reddish and yellowish. These median lighter spots become gradually broader, until near the middle of the body they unite with the yellow of the carinæ, so that the posterior subsegment is yellow, irregularly infused, and stained with various shades of vinous along its anterior margin, and especially at the base of the carinæ. The carinæ also have a very narrow margin of vinous not so dark as that of the dorsum; anterior subsegments uniformly dark vinous. Posterior segments merely reddish, darker than the middle. Posterior half of last segment red. Anal valves very dark, preanal scale somewhat lighter, ventral surface and legs vinous-red, lighter than above.

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Legs of female (Pl. V, fig. 11) proportioned as in *Oxydesmus;* basal joints scarcely hirsute, the last joint densely so.

Length, about 35 mm.; width, 7 mm.

Locality.—Tana River, East Africa.

Type.—National Museum collection, obtained by Mr. Chanler; one female specimen.

ORODESMUS UNICOLOR, new species.

(Pl. VI, Figs. 8–10.)

Intermediate between *O. mastophorus* and *O. bicolor*, more nearly related to the latter, with the description of which as here given it coincides, except in the following characters.

First segment with anterior tubercles smaller and farther apart than in Plate V, fig. 12. Median tubercles of posterior row not so large and not coalesced.

Second and third segments also with median tubercles not coalesced; those of the middle (longitudinal) row larger than in fig. 12; the three median tubercles on each side, as in *mastophorus*, united into a longitudinal ridge, but separated medianly, though not so widely as in *mastophorus.*

Fourth and succeeding segments with the tubercles gradually smaller, the median not specially enlarged or coalesced.

Segments with the three rows of dorsal areas very distinct, the surface of the areas coarsely granular rugose, much more than in *O. bicolor;* tubercles also somewhat more prominent.

Below the carinæ the tubercles are much as in Plate V, fig. 9; the process somewhat larger, but the individual tubercles less numerous and not so long.

Posterior segments with the lateral margins distinctly narrower than in Plate V, fig. 13, and the pore much closer to the edge.

Preanal scale with median process shorter than in *mastophorus.*

Color of dry specimen light dirty brownish with a pinkish tinge, very distinct on the carinæ and posterior segments; legs, head, and antennæ also pinkish.

Animal with more of the aspect of *O. mastophorus* than of *O. bicolor;* dorsum less arched than in *O. bicolor*; about the same as in *O. mastophorus.*

Length, 38 mm.; width, 6 mm.

Locality.—A female specimen from Mombassa, one of the types of *O. mastophorus*, Gerstäcker, as is noted under that species. The pinned specimen is in the Berlin Museum.

ORODESMUS MASTOPHORUS (Gerstäcker).

(Pl. VI, figs. 12–15.)

Polydesmus mastophorus, GERSTÄCKER, Decken's Reise, p. 517, 1873.
Polydesmus (Oxydesmus) mastophorus, KARSCH, Troschel's Archiv, p. 45, 1881.

Vertex with deep sulcus, on each side along the first segment rugose. Antennæ slender.

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First segment short, slightly bisinuate in front, more strongly trisinuate behind; posteriorly broader, the posterior corners sharply pointed and decurved; submarginal ridge like that of the following segments, its interior edge sharply defined.

First four segments: the tubercles lying along the median line are very different from the others, which appear small and irregularly distributed, and are conspicuously large and arranged in two longitudinal rows, three (tubercles) in each row. Those of the first segment are lower and isolated, those of the two following coalesce into two dentate ridges, those of the fourth segment highest.

Subsequent segments ornamented with three transverse regular rows of tubercles; those of the posterior row more mammilliform, higher, and the remainder of the surface finely granulated.

Lateral carinæ projecting above the lateral middle of the body, distinctly, though not strongly ascending, slightly higher caudad; the margins usually with five or six teeth; the first and second segments with three sharp teeth, the third with four; posterior corner on middle segments slightly angled, on the three segments next to the last with a gradually more prominent dentiform process.

Last segment above granular rugulose, posteriorly with a quadrangular process, rounded at apex, and on each side with three teeth, notched between; above, on each side, a wart-like tubercle.

Preanal scale with two blunt-conic setiferous tubercles; between them a shorter process.

Color reddish-brown, the tubercles ferruginous or yellowish; margin of carinæ yellow or light ferruginous. Clypeus on either side ferruginous in the middle, with a broader yellow margin; ventral surface ferruginous. Antennæ ferruginous, the apex brownish. Legs ferruginous yellow.

Length, 44–47 mm.; width, 6¼–6⅔ mm.

Locality.—Two female specimens from Mombassa.

The types of this species are dried specimens, preserved in the Berlin Museum, belonging to two distinct species. The following notes were based on the specimen, to which Gerstäcker evidently gave the most of his attention, and which was the subject of his plate. The other species is here described as *O. unicolor:*

Vertex prominent hirsute, granular rugose.

Clypeus, as described for *bicolor*, rather smooth, hirsute, especially below.

First segment shaped as in Pl. V, fig. 12, but more emarginate posteriorly toward the lateral corners; tubercles in three rows, stronger than in fig. 12, especially the median. Rows 4, 6, 6, situated somewhat as in fig. 12, but the median tubercles wide apart; also those of posterior row, which are large, conico-papilliform. Margin more coarsely dentate than in *O. bicolor.*

Second and third segments also with all the median tubercles wide apart, much larger than the others, the posterior largest, and all three

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united into a longitudinal dentate ridge. On the third segment the tubercles of posterior row next the median ones also very large, but showing no tendency to coalesce with the others.

Fourth segment with tubercles abruptly smaller and showing no tendency to coalesce; tubercles, however, larger than on succeeding segments.

Posterior row of tubercles stronger than the others, but all very distinct.

Pores, especially on anterior segments, facing almost directly laterad.

Length of type specimen, 42 mm.; width, 6.5 mm.

The habit of this species is quite distinct from all the others by reason of the square carinæ and the stronger marginal teeth. Gerstäcker's figure gives a rather correct idea of the general effect.

ORODESMUS PECTINATUS (Karsch).

(Pl. V, fig. 2; Pl. VI, fig. 11.)

Polydesmus (*Oxydesmus*) *pectinatus*, KARSCH, Troschel's Archiv, 1881, pp. 36, 46.

Vertex strongly rugose.

Segments nearly flat, above with two rather deep transverse furrows; obsolete on segments 1–4, each segment with three rows of granule-bearing areas, the posterior row armed with seven to nine acute tubercles.

Fourth segment sparsely covered with irregularly arranged granules; in the middle of the posterior margin armed with a somewhat flattened, six-toothed, comb-like process, yellow in color and equal in length to the fifth segment; the two outer teeth of process shorter.

Lateral carinæ wing-like; those of segments 1 and 2 with margin oblique, three-toothed; segment 4 four-toothed; subsequent segments six-toothed.

Color of head and segments dorsally black; carinæ yellow (in alcohol); antennæ and feet pale.

Length, 43 mm.

Locality.—Wito, East Africa. One female, collected by Dr. Fischer. Type in the Berlin Museum.

This species is strikingly distinct from all others yet known in the possession of the remarkable process of the third segment. So peculiar a structure did this appear that I suspected that it was abnormal. An examination of the type and only extant specimen at Berlin shows that there is no ground for such a supposition. The following notes were made on the type specimen:

First segment shaped like Plate V, fig. 12 (*O. bicolor*), the tubercles similarly arranged, but with four in the middle row and eight in the last; none especially enlarged or coalesced. Anterior raised margin very distinct.

Second segment also without special modification, except that the median tubercles of the last two rows are slightly larger than the others.

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Third segment with the median six tubercles of the last row and the median two of the middle row coalesced into a large, horizontal dentate and fluted process, projecting caudad, and entirely covering the median part of the fourth segment. The lateral tubercles of the process small.

Fourth segment normal, as far as can be seen under the process (the specimen is dry).

Remainder of body resembling *O. mastophorus*, but the dorsum less convex and smoother, the tubercles smaller and more broadly conic; the surface of the areas only faintly granular; marginal teeth usually four instead of six, as in *O. mastophorus*. Anterior marginal tooth largest and most prominent.

Last segment of type with apex injured.

Length, 40 mm.; width, 6.75 mm.

ORODESMUS FISCHERI (Karsch).

(Pl. V, figs. 3, 4.)

Polydesmus (*Oxydesmus*) *fischeri*, KARSCH, Ber. über d. Naturh. Museum z. Hamburg, p. 133, 1884.

Segments 1–3 armed with coarse granules, larger toward the middle, especially the two median.

Segments dorsally divided into three transverse rows of tuberculiferous areas.

Lateral carinæ with the anterior corners rounded, the lateral margin subdenticulate.

Male genitalium twisted, forked somewhat above the middle of its length; the inner fork apically faintly notched, broad and lamellar; the outer apically notched and terminating in a long, thin, pointed, strongly curved hook.

Color black, the carinæ margined with yellow, each segment with a yellow transverse spot on the middle of the posterior margin; last segment black. On the middle segments the yellow spot covers the four middle areas of the two posterior rows. On the anterior segments the spot covers only two adjacent areas; on the first segment only the posterior areas, on the second and third segments two from all three rows are yellow.

Length of adult male, 54 mm.

Locality.—Massai Land, collected by Dr. Fischer.

"This beautiful East African species belongs to the same group as *effulgens*, Karsch, also East African, and is to be distinguished from that species by its greater length and proportional breadth. The anterior corners of the carinæ are rounded in *O. fischeri*, and distinctly pointed in *O. effulgens*. Last segment black in *O. fischeri*, yellow in *O. effulgens*. While in *O. effulgens* the yellow color is continuous from the under side of the carinæ over the entire ventral surface, in *O. fischeri* the under side of the carinæ is black, and only the anterior margin is yellowish, as far as the legs extend." (Karsch.)

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Of all the species here referred to *Orodesmus*, the present seems to be most nearly related to the West African genus *Oxydesmus*, and more especially to *Oxydesmus togoensis*, an undescribed form differing from the other West African species in the greater proportional width and the tendency toward enlargement manifested by the tubercles of the anterior segments. The coloration is also similar to that of *O. fischeri*. The specimen belongs to the Berlin Museum.

ORODESMUS EFFULGENS (Karsch).

(Pl. V, fig. 1.)

Polydesmus (Oxydesmus) effulgens, KARSCH, Troschel's Archiv, 1881, pp. 36, 46.

Vertex strongly rugose.

First segment anteriorly rounded. Segments having the appearance above of transverse oblong rectangles convex in the middle, each marked with three transverse rows of eight subquadrate areas, each armed with a tubercle in the middle; tubercles of the anterior and middle rows (located somewhat behind the middle) rounded, those of the posterior row tooth-like, directed caudad, situated on the posterior margin of the segments.

Lateral carinæ wing-like, armed in the middle with a low tubercle.

Last segment armed with up to four lateral denticules.

Color black or fuscous-brown, the carinæ and four median areas of the middle row yellow.

Length, about 33 mm.

Locality.—Maid, Somali Land, East Africa, altitude 2,000 feet. Specimens of both sexes collected by Hildebrandt and preserved in the Berlin Museum.

EXPLANATION OF PLATES.

PLATE II.

Astrodesmus stellifer.

Fig. 1. Third leg of male.
2. Thirteenth leg of male.
3. Thirty-first leg of male.
4-7. Views of male genitalium.
8. Male genitalia in situ; also the ventral part of the sixth segment.
9. Male genitalium, side view, drawn from a specimen in the British Museum.
10. Anterior view of the sternum of the sixth segment, showing the peculiar median process and two basal joints of the legs.
11. Posterior view of the process mentioned.

Aulodesmus laxus.

12. Genitalium, median view, after Karsch.
13. Same, lateral view, after Karsch.

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PLATE III.

Astrodesmus stellifer.

Fig. 1. Dorsal view of first three segments.
2. Subdiagrammatic cross section of a segment.
3. Dorsal view of the last three segments.
4. Lateral view of same.
5. Preanal scale.
6. Gnathochilarium, including hypostoma.
7. Plan of the eighth joint of an antenna.
8. Last three joints of an antenna.
9. Ventral view of the fourteenth and fifteenth segments of male, showing the process of the fifteenth and the corresponding depression of the fourteenth.

Aulodesmus oxygonus.

10. Sixth and seventh segments, ventral view, after Peters.
11. Fifteenth segment, ventral view, after Peters.
12. Posterior view of a segment, after Karsch.
13. Male genitalium, lateral view, after Peters.
14. Curve of the tooth of same, ventral view, after Karsch.

Tycodesmus falcatus.

15. Genitalium, ventral view, after Karsch.
16. Same, median view, after Karsch.

Aulodesmus mossambicus.

17. Posterior view of segment, after Peters.
18. Genitalium, lateral view.

PLATE IV.

Marptodesmus chanleri.

Fig. 1. Dorsal view of head and first three segments.
2. Antenna.
3. Fifteenth leg of male, anterior view.
4. Third leg of male, posterior view.
5. End of last joint of same, more magnified, anterior view.
6. Last five segments, dorsal view.
7. Last four segments, lateral view.
8. Preanal scale.
9. Male genitalia in situ and ventral parts of sixth and seventh segments.
10. Lateral view of male genitalium, more magnified.

Astrodesmus luridus.

11. Genitalium, lateral view.
12. Same, ventral view.

Orodesmus forceps.

13. Male genitalia, in situ.
14, 15. Lateral views of male genitalia, more magnified.
16. Last three segments, more magnified.

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PLATE V.

Orodesmus effulgens.

Fig. 1. Male genitalium, after Karsch.

Orodesmus pectinatus.

2. Third and fourth segments, after Karsch.

Orodesmus fischeri.

3. Male genitalium, after Karsch.
4. Same, apex of slender arm.

Orthomorpha vicaria.

5. Male genitalium, after Karsch.

Habrodesmus aculeatus.

6. Lateral view of three segments.
7. Last segment, ventral view.

Orodesmus bicolor.

8. Posterior outline view of third segment.
9. Posterior outline view of one of the middle segments.
10. Lateral view of last two segments.
11. Normal leg of female.
12. Head and first two segments, dorsal view.
13. Last three segments, dorsal view.
14. Last segment, ventral view.

PLATE VI.

(Drawn from type specimens in the Berlin Museum.)

Aulodesmus mossambicus.

Fig. 1. Last three segments, dorsal view.
2. Male genitalium, lateral view.
3. Same, median aspect, the anterior side toward the right.

Aulodesmus oxygonus.

4. Last three segments, dorsal view.
5. Male genitalium, lateral view.
6. Same, median view, the anterior side toward the left.
7. Apex of process of sixth segment.

Orodesmus unicolor.

8. Last segment and part of penultimate, dorsal view.
9. Parts of tenth and eleventh segments, showing sculpture and location of pores.
10. First three segments, dorsal view.

Orodesmus pectinatus.

11. Segments 2–4, dorsal view, showing remarkable process of the third segment.

Orodesmus mastophorus.

12. Antenna.
13. Tenth and eleventh segments, dorsal view.
14. Last segment and part of the penultimate, dorsal view.
15. Preanal scale.

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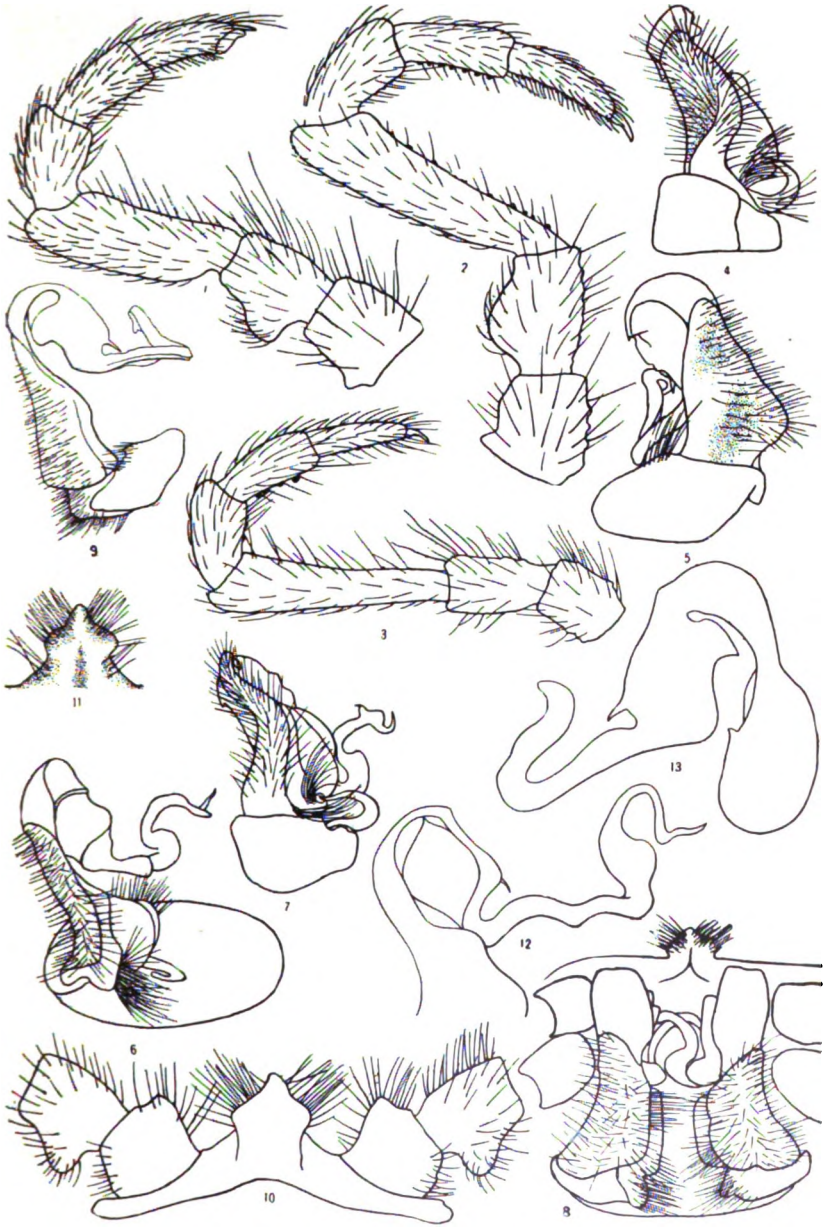

SPECIES OF DIPLOPODA FROM EAST AFRICA

FIGS. 1-11. *Astrodesmus stellifer*
FIGS. 12, 13. *Aulodesmus laxus*

FOR EXPLANATION OF PLATE SEE PAGE 109

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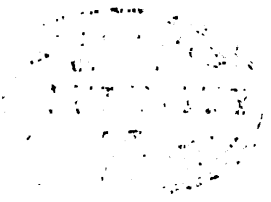

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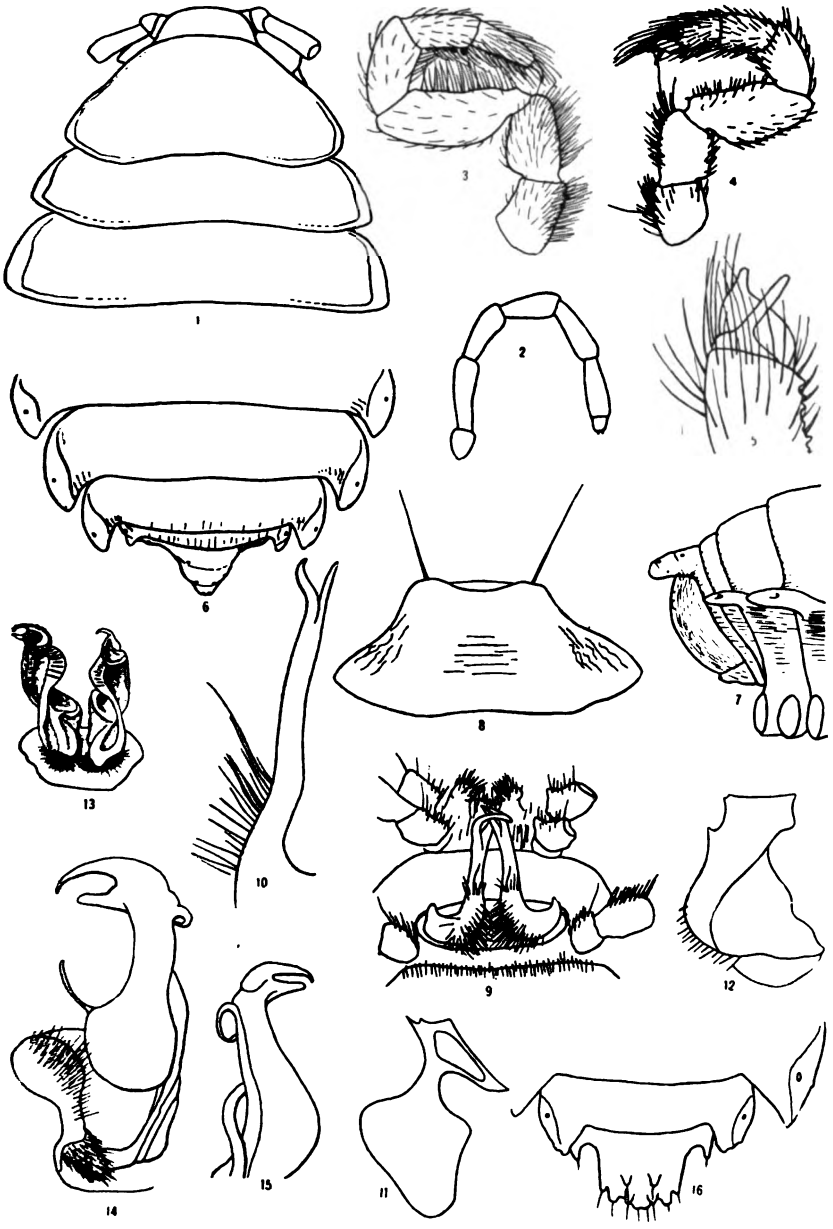

SPECIES OF DIPLOPODA FROM EAST AFRICA

FIGS. 1-10. *Marptodesmus chanleri*
FIGS. 11, 12. *Astrodesmus luridus*
FIGS. 13-16. *Orodesmus forceps*

FOR EXPLANATION OF PLATE SEE PAGE 110

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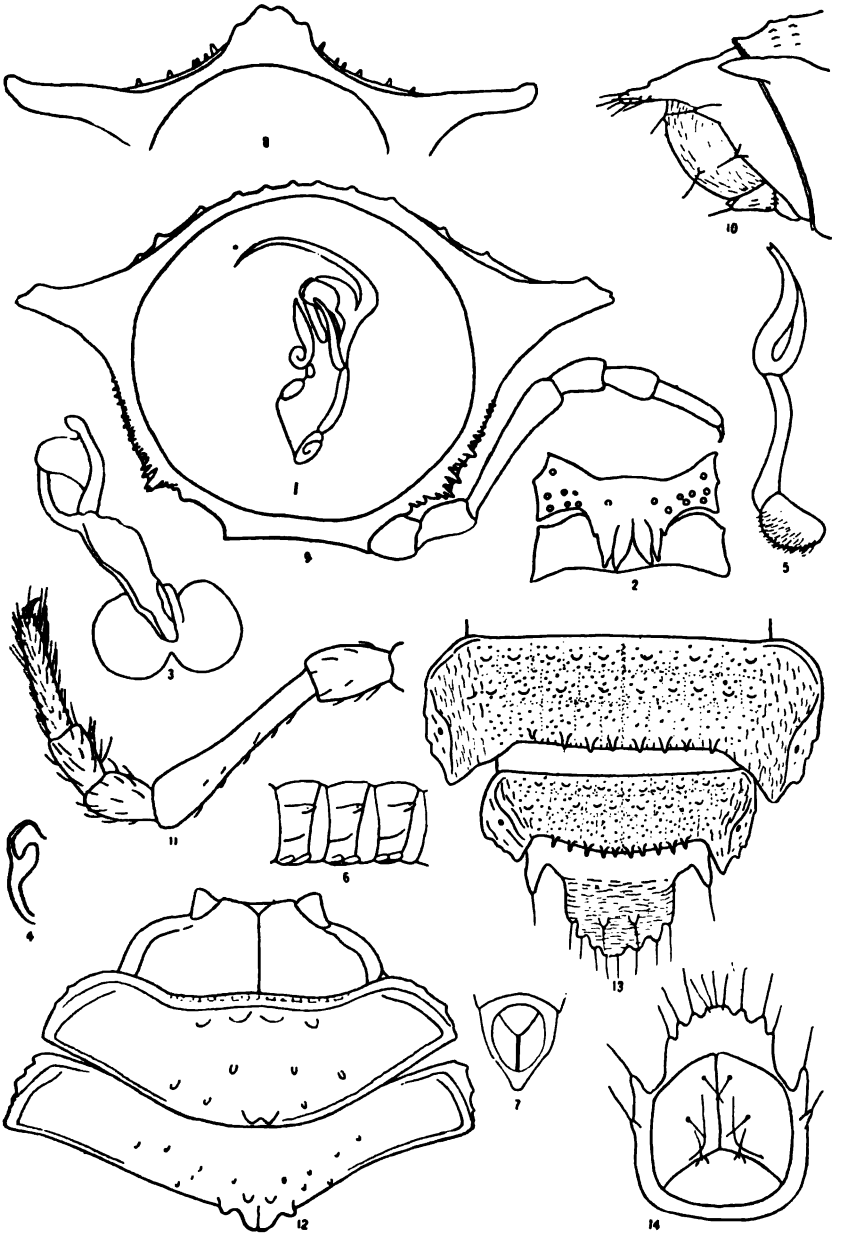

SPECIES OF DIPLOPODA FROM EAST AFRICA

FIG. 1. *Orodesmus effulgens*
FIG. 2. *Orodesmus pectinatus*
FIGS. 3, 4. *Orodesmus fischeri*
FIG. 5. *Orthomorpha vicaria*
FIGS. 6, 7. *Habrodesmus aculeatus*
FIGS. 8-14. *Orodesmus bicolor*

FOR EXPLANATION OF PLATE SEE PAGE 111

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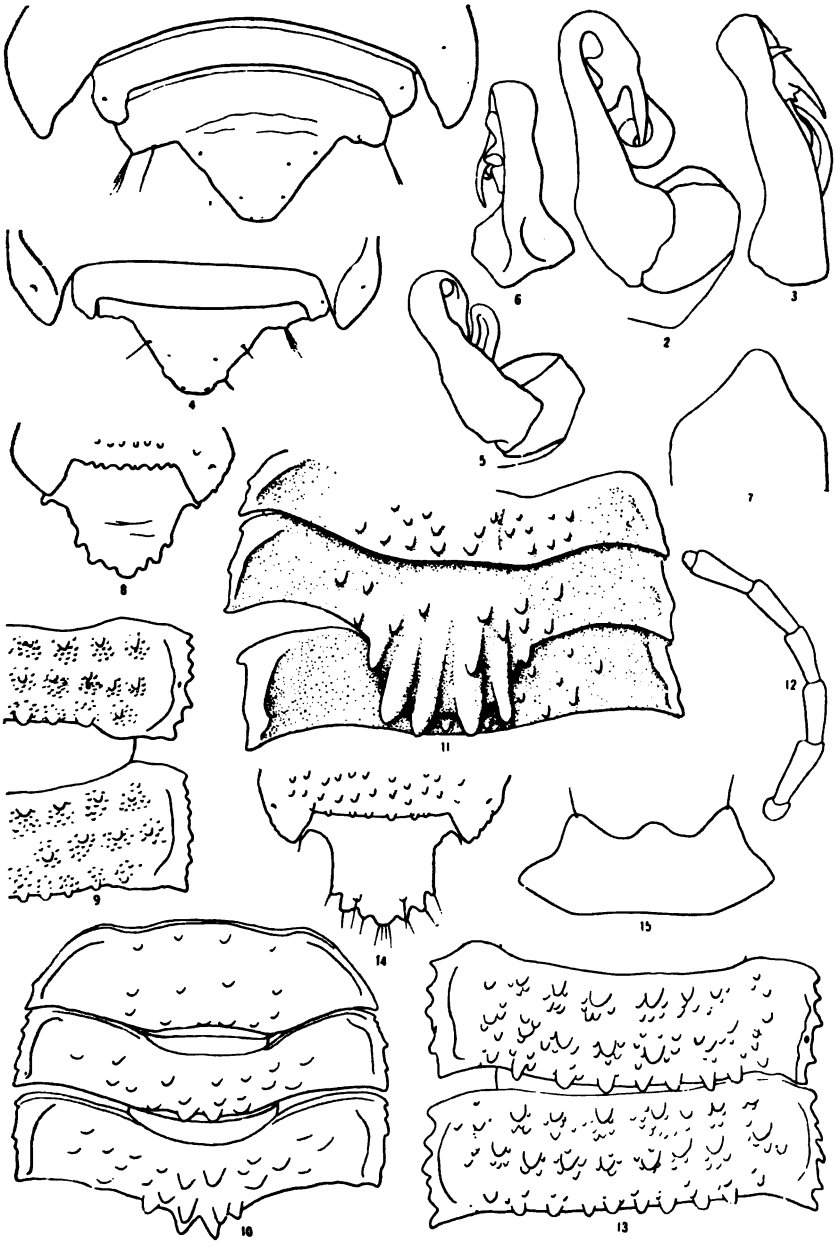

SPECIES OF DIPLOPODA FROM EAST AFRICA

FIGS. 1-3. *Aulodesmus mossambicus*
FIGS. 4-7. *Aulodesmus oxygonus*
FIGS. 8-10. *Orodesmus unicolor*
FIG. 11. *Orodesmus pectinatus*
FIGS. 12-15. *Orodesmus mastophorus*

FOR EXPLANATION OF PLATE SEE PAGE 111

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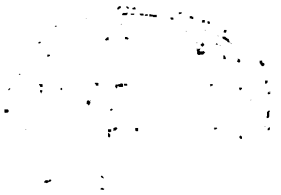

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DESCRIPTION OF A NEW SPECIES OF PIPEFISH (SIPHOSTOMA SCOVELLI) FROM CORPUS CHRISTI, TEXAS.

By BARTON W. EVERMANN and WILLIAM C. KENDALL.

A RE-EXAMINATION of the specimens of pipefish from Corpus Christi which we referred, with hesitation, in an earlier paper,[1] to *Siphostoma fuscum* (Storer), has convinced us that they cannot belong to that species, but represent a species hitherto undescribed.

Type.—Male and female, No. 47300, U. S. N. M.

Locality.—Shamrock Point, Corpus Christi, Texas, where 130 specimens were obtained November 29, 1891, by Messrs. Evermann, Scovell and Gurley, of the U. S. Fish Commission.

Allied to *Siphostoma affine* (Günther).

Description of female.—Head, 7¼; depth, 14; snout, 2¼; D. 34, on 4+4 rings; its height 2 in base, which equals head. Rings, 16+32. Nape slightly carinated. Color in alcohol, alternately annulated with light olive brown and dirty white; the dark color on joints, the white on the bodies of rings; dark color wider than white on trunk, narrower on caudal portion; white annulations on trunk between lateral and latero-ventral keels indicated by two narrow white lines with narrow black lines on either side and between, these portions of the whitish rings showing as silver bars in life and fresh alcoholic specimens; upper part of opercles dusky; a dark bar extending from anterior edge of eye to end of snout; ventral keel, throat, lower part of opercles and snout, plain, whitish; dorsal with dark wavy diagonal bars. Other specimens vary in color from somewhat lighter to considerably darker than the above, the darker ones having some white mottling on throat, opercles, and beneath snout. Other females differ in the much less depth, lower dorsal fin, and in the color, which ranges from almost plain olive through forms with reddish mottled appearance to brownish; fewer light-colored annulations and no distinct white or silver bars on sides.

[1]The Fishes of Texas and the Rio Grande Basin, considered, chiefly, with reference to their geographic distribution. Bull. U. S. Fish Comm., XII, 1892 (February 6, 1894), 109.

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Description of male.—Head, 7½; depth, 22½; snout, 2¼; D. 33, on 4+4 rings; its height 2⅜ in its base, which equals head. The male differs from the typical female in the much less depth, lower dorsal fin, and in the coloration, all of which characters are those of the shallow females. There is in the male, as in the female, considerable color variation, but there are never any distinct white or silvery marks on the sides. Of the 130 specimens, 114 are females and young, 16 being adult males. Some of these were called by us *Siphostoma fuscum*, in the "Fishes of Texas and the Rio Grande Basin."[1]

A re-examination of these specimens and of another lot of the same kind which had been misplaced at the time of the first examination shows this identification to be incorrect and the fish probably identical with *Siphostoma affine* of Jordan and Gilbert and subsequent authors. But the range of characters in the large series examined by us seems insufficient to permit the identification of this species with *Sygnathus affinis*, Günther.[2]

The specimens from the coast of the Gulf of Mexico referred to *Siphostoma affine* by most recent writers, belong apparently to this species rather than to the *Sygnathus affinis* of Günther. While the differences between the two are not great, they appear to be constant in a large series of specimens.

In the following table we give the results of detailed examination of 29 specimens of this species:

Table showing variations in specimens of Siphostoma scovelli collected in Texas.

Rings.	Dorsal fin.			Head.	Snout.	Sex.
	On rings.	Rays.	Height in base.			
16+33	3+5	33	3⅜	7⅛	2⅛	♀
16+32	4+4½	33	3	7⅛	2¼	♀
16+32	4+4½	33	2⅜	7⅛	2¼	♀
16+33	4+4	34	2+	7⅛	2	♀
16+33	3+4	31	2⅜	7¼	2⅛	♀
16+31	4+4	30	2⅜	7⅜	2⅜	♀
16+33	3+4½	31	2⅜	7	2⅜	♀
16+33	4+4½	34	2⅛	7⅜	2⅛	♀
16+31	4+4	31	2⅜	7	2⅜	♀
16+32	4+4	31	2⅜	7⅜	2⅜	♀
16+31	4+4	34	3	8	2⅛	♀
16+32	4+4	33	3¼	7⅜	2⅛	♀
16+30	4+4	31	3	7⅜	2⅛	♀
16+31	4+4	32	3	7⅜	2⅛	♀
16+32	4+4	33	2⅜	8	2⅛	♀
16+32	3+5	33	3	7	2⅛	♀
16+32	3+4	29	2½	8	2	♀
16+32	4+4	31	3⅛	7⅛	2⅛	♀
16+33	4+4	33	2⅜	7⅜	2	♀
16+31	4+4	32	2⅜	7⅜	2⅛	♂
16+30	4+4	30	3	7⅜	2	♂
16+32	4+4	34	2⅜	7⅜	2⅛	♂
16+32	4+4	32	3	7⅜	2⅛	♂
16+32	4+4½	33	3	7⅜	2⅛	♂
16+32	4+4½	33	4	7⅜	2⅛	♂
16+32	4+4	33	2⅜	7⅜	2⅛	♂
16+32	3+5	33	2⅜	7⅜	2⅛	♂
16+32	4+4	33	2⅜	7⅜	2⅛	♂
16+33	3+5	31	3	7⅜	2⅛	♂

[1] Bull. U. S. Fish Comm., 1892, 109.

[2] Cat. Fishes Brit. Mus., 163, 1870.

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We have examined 13 specimens obtained by Dr. J. A. Henshall on the west coast of Florida, and identified by him as *S. affine*, and find them to agree perfectly with the Corpus Christi specimens, as may be seen from the following table. The first eleven of these specimens were obtained at Marco, Florida; the other two at Key West:

Table showing variation in specimens of Siphostoma scovelli collected in Florida.

Rings.	Dorsal rings.	Dorsal rays.	Height of dorsal fin in base.	Head.	Snout.	Sex.
16+31	4+4	32	2½	6½	2¼	♀
16+32	3+4	32	2⅝	7+	2¼	♀
16+33	3+4½	33	3	7	2¼	♀
16+31	3+4	27	2	7½	2¼	♀
16+33	3+4	28	2½	8	2⅜	♀
16+31	3+5	×	×	6½	×	♀
16+30	3+5	32	2⅜	8	2¼	♂
16+31	3+4	29	2⅜	7	2½	♂
16+26[1]	3+4	32	3	×	2¾	♂
16+31	3+4	×	×	7½	2⅞	♂
16+32	3+4	×	×	6⅝	2⅜	♂
16+31	3+4	30	2+	7⅛	2½	♀
16+30	3+4	29	3	6⅜	2¼	♀

[1] Mutilated.

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DESCRIPTION OF A NEW SPECIES OF SNAKE (TANTILLA EISENI) FROM CALIFORNIA.

By LEONHARD STEJNEGER,

Curator of the Department of Reptiles and Batrachians.

AMONG the many valuable and interesting reptiles collected by Dr. Gustav Eisen at Fresno, California, and presented to the National Museum many years ago, there are a number of small snakes belonging to the opisthoglyph genus *Tantilla*, which have hitherto been referred to *Tantilla nigriceps*. A recent examination of these specimens has convinced me that they do not belong to Kennicott's species, being in fact undescribed. This species I propose to name in honor of the gentleman who collected them.

TANTILLA EISENI, new species.

Diagnosis.—Supralabials seven; posterior nasal in contact with preocular; temporals elongate, 1+1; first pair of sublabials not in contact behind mental; ventrals, 176–181; subcaudals, 58–65; head blackish, bounded behind by a white collar about three scale lengths from parietals.

Habitat.—San Joaquin Valley, California.

Type.—No. 11766*a*, U. S. N. M.; Fresno, California; Dr. G. Eisen, collector.

Description of the type.—Head very flat above, rather broad across the anterior temporals; eyes small; rostral wider than high, the portion visible from above longer than the internasal suture; internasals short; prefrontals nearly twice as large as internasals, their lower border wedged in between posterior nasal and preocular, but not in contact with supralabials; frontal rather long, six-sided, angular in front and behind, the lateral borders nearly parallel; supraoculars rather small, half as wide as frontal; parietals long and narrow, nearly as long as their distance from tip of snout; nasals long, the posterior in contact with preocular, which is but slightly shorter; no loreal; one preocular; two postoculars; temporals long, 1+1; supralabials 7, last one largest, third and fourth entering eye; sublabials 7, four in contact with first

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pair of chin shields; first pair of sublabials not in contact behind mental; 15 rows of smooth scales; 4 rows of scales between posterior chin shields and ventrals; ventrals 176; anal divided; subcaudals, 62+1. Color (in alcohol) uniform pale flesh color, slightly darker grayish brown above; top of head, lores, temples, and nape for a distance of 3 scale-lengths back of the parietals, dark grayish-brown; behind this a narrow white band, one scale-length wide, bordered behind by a few dark-brown dots. Total length, 365 mm.; tail, 82 mm.

Remarks.—The present species differs from all our North American Tantillas with seven supralabials, in being proportionally much longer and slenderer, and the number of ventrals and subcaudals is greatly in excess of that of our other species.

The characters of this interesting novelty are fully corroborated by six additional specimens in the Museum as shown by the following list:

List of specimens of Tantilla eiseni.

U. S. Nat. Mus. No.	Collector.	Locality.	Ventrals.	Anal.	Subcaudals.
11766*a*	Eisen	Fresno, California	176	‡	62+1
11766*b*	do	do	167	‡	65+1
11766*c*	do	do	179	‡	62+1
11766*d*	do	do	176	‡	Def.
11766*e*	do	do	172	‡	61+1
11766*f*	do	do	178	‡	59+1
11766*g*	do	do	181	‡	58+1

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DESCRIPTION OF A NEW SPECIES OF GROUND WARBLER FROM EASTERN MEXICO.

By ROBERT RIDGWAY,
Curator of the Department of Birds.

THE VERY interesting addition to the avifauna of Mexico described below, was obtained by purchase from Mr. Frank B. Armstrong, of Brownsville, Texas, and was at first supposed to be the *Geothlypis cucullata* of Salvin and Godman,[1] but when compared with specimens of that species belonging to the division of ornithology and mammalogy of the Department of Agriculture, was found to be exceedingly distinct, *G. cucullata* being intimately related to *G. bairdi*, Nutting,[2] of Eastern Nicaragua and Costa Rica, while the new species from Tampico is more closely related to *G. beldingi*, Ridgway,[3] of Lower California. This close relationship to a Lower Californian species is remarkable, since no form related to them occurs, so far as known, in the intervening territory.

The new species may be characterized as follows:

GEOTHLYPIS FLAVOVELATUS, new species.

ALTA MIRA—YELLOW-THROAT.

Specific characters.—Similar to *G. beldingi*, Ridgway, of Lower California, but much smaller, with the broad yellow band, bordering the hinder edge of the black "mask," more sharply defined and deeper yellow, and the coloration throughout more intense. More like *G. melanops*, Baird, in size, but still smaller, and readily distinguished by the clear yellow instead of white postfrontal and postauricular band.

Geographic range.—Eastern Mexico (Alta Mira, near Tampico, State of Tamaulipas).

Type.—No. 135180, U. S. N. M.; adult male, from Alta Mira, near Tampico, Tamaulipas, Mexico, collected by F. B. Armstrong, December 5, 1894. A frontal band (about 0.27 of an inch wide), lores, orbits, malar region and auriculars black, forming a sharply defined "mask;" behind this a well-defined band (about 0.15–0.18 of an inch wide), of clear

[1] Ibis, April, 1889, p. 237. Type from Cofre de Perote, State of Vera Cruz.
[2] Proc. U. S. Nat. Mus., VI, p. 398, 1883. Type from Los Sábalos, Nicaragua.
[3] Proc. U. S. Nat. Mus., V, p. 344, September 5, 1882.

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canary-yellow, inclining to light chrome-yellow; rest of upper parts uniform olive-green, browner anteriorly, especially on occiput. Under parts intense yellow, paler, more lemon-yellow on belly and under tail-coverts, the sides and flanks yellowish olive-brown. Maxilla black, brownish on tomium; mandible blackish brown terminally, whitish basally; legs and feet rather dark horn-color. Length (skin), 4.90; wing, 2.10; tail, 2.08; exposed culmen, 0.50; tarsus, 0.83; middle toe, 0.55.

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EAST AFRICAN ODONATA, COLLECTED BY DOCTOR W. L. ABBOTT.

By PHILIP P. CALVERT.

THE Odonata collected in Zanzibar and the Kilimanjaro region in 1889–90 by Dr. W. L. Abbott were sent by him to the United States National Museum at Washington in two lots. Thanks to the kindness of the authorities of the Museum, I have had the opportunity of studying them, with the results set forth in the following pages. The total number of specimens is sixty-four, representing thirteen species. Of these, four species are here described as new, viz: *Orthetrum truncatum*, *O. abbotti*, *Aeschna rileyi*, and *Disparoneura abbotti*. Three other species, *Trithemis furrugaria*, Rambur, *Orthetrum brachiale*, Beauvois, and *Anax rutherfordi*, McLachlan, have hitherto been known only by brief descriptions or by but one sex; the present opportunity has been seized to render our knowledge of them more complete.

PANTALA FLAVESCENS, Fabricius.

Libellula flavescens, FABRICIUS, Ent. Syst. Suppl., p. 285, 1798.
Pantala flavescens, HAGEN, Syn. Neur. N. Amer., p. 142, 1861; Stett. Ent. Zeit., XXVIII, p. 215, 1867; Proc. Bost. Soc. Nat. Hist., XVIII, p. 63, 1875.—KIRBY, Cat. Odon., p. 1, 1890.
Libellula viridula, BEAUVOIS, Ins. Afr. Amer., p. 69, Névr., pl. III, fig. 4, 1805–1821.—RAMBUR, Nèvropt., p. 38, 1842.
Libellula analis et *terminalis*, BURMEISTER, Handb. Ent., II, p. 852, 1839.
Libellula Sparshallii, CURTIS, Guide, p. 162.—SELYS, Monog. Lib. Eur., p. 36, 1840; Revue Odon. Eur., p. 322, 1850.

Locality.—One female in the National Museum collection, from Kilimanjaro. This species, as is well known, is distributed all over the world, except Europe.

TRAMEA LIMBATA, Desjardins.

Libellula limbata, DESJARDINS, Rapport Soc. Maurice, I (1832); Bull. Soc. Ent. France, IV, p. 4, 1835.
Tramea limbata, KIRBY, Trans. Zool. Soc. Lond., XII, p. 318, 1889; Cat. Odon., p. 4, 1890.
Libellula mauriciana, RAMBUR, Névr., p. 34, 1842.

One female in the National Museum collection, obtained at the Seychelles by Dr. W. L. Abbott, belongs, I believe, to this species. It differs

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from Rambur's description only in having the posterior angle of the lateral lobes of the labium luteous, not black, and the articulations of the abdomen are blackish, especially at the sides.

Additional details: Appendages longer than the last two, but not as long as the last three, abdominal segments.

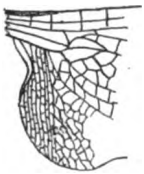

Fig. 1.

Fig. 2.

TRAMEA LIMBATA, Female.

(1) Base of right hind wing. (2) Ventral surface of last two abdominal segments.

Basal spot of hind wings deeply cleft exteriorly at the basilar space, reaching outward in the subcostal space to the first antecubital; in the median space not as far as the triangle except by a slender limb along the postcostal vein to the posterior angle; no clear space within the spot along the anal margin, but just beyond the apex of the membranule is a paler area, where the cells, like those below the postcostal vein, are clearer in the center. Front wings with 11–12 antecubitals, 9–10 postcubitals, triangle with one cross vein. Hind wings with 7 antecubitals, 11–12 postcubitals. Pterostigma luteous, longer on front than on hind wings.

Measurements.—Length, 46 mm. Abdomen (including appendages), 31. Front wing, 43. Hind wing, 41. Pterostigma, 3 (front), 2 (hind). Appendages, 3.6.

SCHIZONYX LUCTIFERA, Selys.

Zygonyx ? luctifera, SELYS, Ann. Soc. Ent. Belg., XII, p. 96, 1869; Ann. Mag. Nat. Hist. (4), III, p. 273, 1869.

Schizonyx luctifera, KARSCH, Berl. Ent. Zeit., XXXIII, p. 281, 1890.—SELYS, Ann. Soc. Ent. Belg., XXXV, p. ccxxvi, 1891.

Schizopyga luctifera, KIRBY, Cat. Odon., p. 184, 1890.

Male.—Vertex truncate, dark metallic blue. Frons with a median groove superiorly, dark metallic blue, a yellow spot on each side inferiorly. Nasus black in the middle, yellow on each side. Rhinarium and lips black; occiput brown.

Prothorax blackish; posterior lobe very small; its hind margin entire, rounded.

Thorax dark metallic blue; a humeral stripe and five or six spots on the sides, yellow.

Feet blackish; femora somewhat reddish. Hairs of the feet short, 14–15 pairs on hind tibiæ.

Abdomen black, rather slender, very little swollen at the base, tapering gradually to apex; 2 and 3 each with a supplementary carina, that of 3 forming an obtuse angle, directed forward, on the dorsum of the segment; 4 with a slight indication of a supplementary carina.

Superior appendages not as long as the last two segments, black; viewed from above, straight, slightly thickened on the inner side before the apex, which is moderately acute; viewed from the side, each is directed downward, thickened inferiorly in the apical half with 3–4

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denticles on the basal side of the thickening, apex acute. Inferior appendage about one-eighth shorter than the superiors, dark brown; viewed from below, triangular; apex slender, about one-tenth as wide as base, moderately acute, extreme tip upcurved.

Genitalia of 2 not prominent. Anterior lamina rather flat, a small tubercle and a depression on each side; apex rounded, entire. Hamule projecting farthest, its apex bifid, so that the anterior (internal) branch forms a distinct, rounded, and somewhat slender hook; posterior branch not developed. Genital lobe rather narrow, not projecting as far as lamina or hamule.

Wings hyaline, reticulation blackish. Pterostigma dark brown, trapezoidal, its external side forming a more acute angle with the costa than the internal. Membranule pale-brownish. Sectors of the arculus distinctly stalked; no hypertrigonals; one median cross vein[1] placed distinctly nearer the base than the first antecubital; discoidal triangles free (with one cross vein in the right front wing of one male), that of the front wing placed a short distance (1.5 mm.) beyond the apex of that of the hind wing; nodal sector distinctly waved beyond the middle. Front wings with 10–11 antecubitals, the last one not continuous; 9–10 postcubitals; internal triangle of one or two cells, hardly distinct from adjacent cells; two or three posttriangular cells; then two rows. Hind wings with 6–7 antecubitals, 11–12 postcubitals, no internal triangle, inner side of discoidal triangle slightly nearer the base than the prolongation of the arculus; two or three rows of posttriangular cells; sectors of the triangle united at their origin.

Fig. 3.

SCHIZONYX LUCTIFERA, Male.

Side view of genitalia of second abdominal segment.

Measurements.—Length of male, 45 mm. Abdomen (including appendages), 33. Front wing, 38. Hind wing, 37. Distance of nodus from base on front wings, 20; on hind wings, 16. Pterostigma, 2. Superior appendages, 2.

Locality.—Two males in the National Museum collection, obtained at the Seychelles by Dr. W. L. Abbott.

The female is unknown to me.

The generic characters of *Schizonyx*, as drawn up by Dr. Karsch[2] and Baron de Selys,[3] are as follows: Eyes with a small projection on their hind margin as in the *Cordulina;* cardinal cell triangular [=discoidal triangle]; in the front wings placed as in the *Libellulina*, with the acute angle directed backward, free; internal triangle of front wings two [or one] celled; two rows of posttriangular

[1] One cross vein in the space called "median" by Baron de Selys in the Monog. Gomph., pl. 22, but "sous-median" in his paper in Vol. XXXV, Ann. Soc. Ent. Belg.

[2] Berl. Ent. Zeit., XXXIII, p. 281, 1890.

[3] Ann. Soc. Ent. Belg., XXXV, p. ccxxvi, 1891.

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cells in the front wings; anal angle of hind wings of male rounded, no internal triangle on the hind wings; tooth on tarsal nails shorter than the apex of the nail itself; nodus [slightly] nearer the apex than the base [of the front wings]; front wings with 10 [-11] antecubitals, the last one not continuous; only one median cross vein in all four wings.

With these characters the present specimens agree, the slight modifications which I have inclosed in brackets being of little importance.

In Dr. Karsch's "Beiträge zur Kenntniss der Arten und Gattungen der Libellulinen,"[1] he has placed the genera *Schizonyx*, Karsch, and its ally *Zygonyx*, Selys, in that "Abtheilung" (of Brauer's fourth group) characterized by having the sectors of arculus separated at their origin or arising from a very short stalk. It would appear, however, that at that writing at least, Dr. Karsch had not seen any specimens of *Zygonyx* or *Schizonyx*,[2] nor did any then published description mention this detail of venation. Baron de Selys[3] says of *Zygonyx*, "secteurs de l'arculus soudés a la base en une seule tige," and mentions no difference in this respect for *Schizonyx*. The specimens of *S. luctifera* above described have the sectors of the arculus as distinctly stalked at their origin as in *Orthetrum*, *Macrothemis*, or other undoubtedly long-stalked genera. *Schizonyx* would thus fall within the group *Scapanea* to *Untamo* of Dr. Karsch's arrangement. On the other hand, the position of the discoidal triangle of the front wings, in being situated a little beyond that of the hind wings, as well as the trapezoidal form of the pterostigma, indicates some affinities with the group of *Tramea*, Hagen. Of the nine genera recognized by Mr. Kirby and Dr. Karsch as belonging to this group, the tropical American *Miathyria*, Kirby, most approaches *Schizonyx*, but differs from the latter in having no small prominence on the hind margin of the eyes, nodal sector not waved beyond the middle; front wings with 7–9 antecubitals, 5–8 postcubitals; hind wings with 4–5 antecubitals, 6–9 postcubitals, and proportionately wider at base than in *Schizonyx*.

PALPOPLEURA VESTITA, Rambur.

Palpopleura vestita, RAMBUR, Névropt., p. 132, pl. 3, fig. 2b, 1842.—BRAUER, Verhd. k. k. zool.-bot. Gesell., Wien, XVIII, p. 716, 1868.—SELYS, Enum. Odon. Madag. (in Pollen & Van Dam's Recherches sur la Faune de Madag., 5me part., 1re livr.), p. 20, 1869.—KIRBY, Cat. Odon., p. 9, 1890.

Palpopleura confusa, RAMBUR, Névropt., p. 133, pl. 3, fig. 3c, 1842.

Locality.—One male in the National Museum collection, from Zanzibar.

[1] Berl. Ent. Zeit., XXXIII, 1890, p. 356.

[2] For *Zygonyx*, I infer this from the general tone of his article in Berl. Ent. Zeit., XXXIII, pp. 280–284, and for *Schizonyx* are his own words, "der mir unbekannten *Schizonyx luctifera*" (Berl. Ent. Zeit., XXIII, p. 282).

[3] Ann. Soc. Ent. Belg., XXXV, 1891, p. ccxxviii.

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TRITHEMIS FERRUGARIA, Rambur.

Libellula ferrugaria, RAMBUR, Névropt., p. 82, 1842.
Trithemis ferrugaria, KIRBY, Cat. Odon., p. 19, 1890.

Locality.—Seven males and two females, from Kilimanjaro.

Male.—Vertex, frons, nasus, and occiput reddish brown. Tip of vertex slightly concave from side to side. Frons very similar to that of *Libellula erythræa*, Brullé; deeply grooved on the median line, forming a well-marked tubercle on either side, which is separated from the vertex by a transverse groove. Rhinarium, labrum, labium, and rear of head ocher brown.

Thorax brown. Hind margin of prothorax more or less bilobed.

Feet light brown or reddish, spines black.

Abdomen trigonal, not inflated at the base when viewed from above, and but little when viewed from the side, gradually tapering to the apex; brown (probably reddish in life), marked with black as follows: A line on the dorsal carina of the middle third of 3 (and sometimes of 2), of the basal half of 4–7 and of the greater part of 8; a median dorsal spot or line on the greater part of 9; a line on the middle of the lateral carinæ of 3–8. Venter black. Sometimes a black spot on sides of 2. Two and three with the usual median transverse carina each.

Fig. 4.

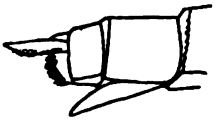

Fig. 5.

TRITHEMIS FERRUGARIA.

(4) Side view of genitalia, male; (5) Side view of last two abdominal segments and vulvar lamina, female.

Genitalia of 2 a little prominent, very similar to those of *erythræa*, Brullé. Anterior lamina short, margin entire, straight. Hamule with the internal branch rather slender, simple, curved inward and backward, apex acute; external branch longer, thicker, somewhat lamellate, directed backward, concave from side to side anteriorly; apex broad, moderately acute, extreme tip being on the postero-external side and directed outward. Genital lobe projecting as far ventrally as the external hamular branch, apex rounded.

Superior appendages reddish, a little longer than 9; straight, dilated on the inner and lower sides before the apex, which is acute, and bearing on the lower surface 8–10 black denticles. Inferior appendage $\frac{1}{8}$–$\frac{1}{10}$ shorter, about half as wide at its base as it is long, tapering gradually to the apex, which is slightly upcurved, ending in the usual two denticles, which reach beyond the last denticle on the superiors.

Wings hyaline; reticulation reddish brown near the anterior margin, becoming blackish posteriorly. Pterostigma light brown. Membranule gray. Front wings with a yellowish tinge at extreme base. Hind wings with a ferrugineous basal spot, extending outward to the arculus and from the anterior margin nearly to the posterior. Sectors

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of the arculus stalked; one cross vein in the median space,[1] placed nearer the base than the first antecubital; no hypertrigonals; nodal sector almost straight. Front wings with 10–12 antecubitals, the last one not continuous, 6–9 postcubitals; triangle with one cross vein; internal triangle of three cells, three rows of posttriangular cells. Hind wings with 8–9 antecubitals, 7–10 postcubitals, triangle free, no internal triangle, two rows of posttriangular cells, sectors of the triangle arising from the same point.[2]

Female.—Vertex and frons shaped as in male, luteous. Occiput dark brown. Nasus, rhinarium and lips yellow. Rear of head, thorax, feet and abdomen luteous. Hind margin of prothorax slightly truncate, with a trace of a median emargination. Thorax paler on the sides. Abdomen with black marks similar to those of male. Appendages simple, straight, luteous, not quite as long as 9. Vulvar lamina produced a little beyond the apex of 10, its margin entire; apex rounded. Wings similar to those of male; basal ferrugineous spot on hind wings not extending as far toward the posterior margin. Front wings with 10–11 antecubitals, 8–9 postcubitals. Hind wings with 8–9 antecubitals, 7–9 postcubitals.[3]

Measurements of Trithemis ferrugaria.

	Male.	Female.
	mm.	*mm.*
Total length	34 –37	34
Abdomen*	21 –22	22
Front wing	28.5–31	30–30.5
Hind wing	26.5–30	28–28.5
Pterostigma	3 – 3.5	3.5

* Here, as always, I include the appendages.

Rambur has described only the male of this species. His description is mainly comparative, noting the differences from *T. erythræa*, Brullé (*T. ferruginea*, Vander Linden) as follows:

A little smaller than *T. ferruginea*, resembling it extremely; of a lighter color, red, depending on the age. Head having the face and the vertex a little less projecting. Posterior lobe of the prothorax sensibly projecting, slightly notched in the middle (projecting in *T. ferruginea*). Abdomen much less broad, less depressed, trigonal, narrow posteriorly, reddish, having small, black, long, and narrow spots

[1] Variations: One male has two such median cross veins in left front wing and in both hind wings, and has triangle of right hind wing with one cross vein. Another male has two median cross veins in right hind wing, and the triangle of left hind wing with one cross vein. A third male has two median cross veins on left hind wing. A fourth male has both hind wings with two median cross veins. The additional median cross vein is always on the outer (apical) side of the normal.

[2] Variation: On right hind wing of one male the upper sector of the triangle arises from the lower sector a short distance from the origin of the latter.

[3] Variations in venation of these two females: One has right hind wing with triangle having one cross vein, and both hind wings with the sectors of the triangle separated a short distance at their origins. The other has the left hind wing with two median cross veins.

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on the lateral and dorsal border; hamules having the internal branch longer and the external shorter; substylar piece [=inferior appendage] narrower. Wings transparent, with the veins red and the base a little spotted with reddish yellow; pterostigma smaller, ferrugineous; ten to eleven veins in the first costal space; membranule reddish, a little obscure.

These differences hold good for the present specimens. The size of *T. erythræa* is: Total length, male, 37–41.5; female, 33–38; abdomen, male, 23–27.5; female, 20.5–25.5; hind wing, 26–30.5, pterostigma, 3.5–4. The fifth abdominal segment at apex measures nearly 4 mm. in *T. erythræa*, 2 mm. in *T. ferrugaria*. The internal hamular branch does not appear to me to be longer than in *T. erythræa*, but the external branch is proportionately shorter. A figure of the genitalia of a male specimen of *T. ferrugaria* accompanies this paper. A similar figure for *T. erythræa* accompanies my report on the Odonata of the United States Eclipse Expedition to the Congo.

The female of *T. ferrugaria* may easily be distinguished from that of *T. erythræa*, as the latter has the vulvar lamina more nearly at right angles to the abdomen and reaching backward no farther than the middle of the ninth abdominal segment.

A comparison of specimens of *T. ferrugaria* and *T. erythræa* with the generic characters given by Mr. Kirby[1] for *Trithemis* and *Crocothemis*, to which these species are respectively referred by him,[2] shows the only difference to be that *Trithemis* has the "abdomen moderately slender," while *Crocothemis* has the "abdomen stout." I have not been able to detect any other generic character between these two species. In view of their close relationship, as shown above, the claims of *Crocothemis* to generic rank may well be doubted.

Genus ORTHETRUM (Newman) Karsch.

The three following species agree with the characters laid down for *Orthetrum* by Dr. Karsch,[3] viz:

Last antecubital continuous, hind wings with only one cross vein in the median space, sectors of the arculus distinctly stalked, basal side of the cardinal cell [i. e., discoidal triangle] in the hind wings in the prolongation of the arculus; nodal sector strongly waved beyond the middle; membranule large, vertex in the male distinctly bifid, discoidal field of the front wings of three to five rows of cells varying according to the size of the species; sides of the eighth abdominal segment in the female dilated, frons anteriorly flat, shieldlike, marginate; abdomen thin, often very slender, often swollen at the base; hind tibiæ with a few (5–8) widely separated, very strong spines on the outer, under side.

Dr. Karsch adds that the upper sector of the triangle in the hind wings arises on the outer side of the triangle always distinctly removed

[1] Trans. Zool. Soc., London, XII, pp. 278, 279, 1889.
[2] Cat. Odon., pp. 19, 21.
[3] Ent. Nach., XVII, p. 58.

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from the hind angle. A comparison of fifty-one specimens of twelve species of *Orthetrum* now available shows this character not to be generic. Only nine specimens, representing four species, can be said to have the sectors of the triangle distinctly separated at their origin; the remaining forty-two specimens, representing nine species, have the sectors more or less united. It is only fair to state, however, that among these latter are some specimens which puzzle me to say whether the sectors are to be spoken of as united or separated. Moreover, there are specimens which differ in this particular, in the right and left hind wings; and of at least two species, specimens occur having sectors united and others with the sectors separated.

The terms "shield-like, marginate," applied to the frons, refer to the demarcation of the anterior face from the sides by a vertical carina on each side, the two carinæ being united at their lower ends by a horizontal carina just above the suture, separating the frons from the nasus.

ORTHETRUM TRUNCATUM, new species.

Male.—Vertex dark brown. Frons anteriorly and superiorly dark olive brown, sides yellow, a black line in front of the eyes. Epistoma, lips, and occiput luteous; mentum varying from luteous to black. Nasus sometimes of the same color as the frons.

Prothorax brownish; posterior lobe as broad as the median lobe, its hind margin slightly emarginate at the middle.

Dorsum of thorax somewhat luteous, a rather narrow antehumeral black stripe reaching the anterior margin below, and almost the wing bases above; summit of the median carina, edges of antealar sinuses, etc., black; a longitudinal dorsal interalar whitish stripe. Sides reddish-brown, an oblique pale-yellow stripe immediately behind the first and second lateral sutures, not reaching the bases of the feet below, clearly defined in their lower halves by a narrow circumscribing black stripe; upper halves not circumscribed, ill defined. Behind the second yellow stripe the color of the sides is pale olive. Pectus obscure, luteous. Latero-ventral metathoracic carina of same color as sides in younger males; black in older ones. In older males the colors of the thorax are more or less concealed by pruinose.

Feet black, upper surface of first femora and first and second tibiæ luteous in younger males.

Abdomen viewed from above somewhat dilated at the base; moderately narrowed at the base of 4, gradually becoming slightly wider to the apex of 6; thence narrowing very slightly to the apex; viewed from the side, noticeably dilated at the base, but not constricted; pruinose in all the specimens examined.

Superior appendages black, not as long as the last two segments; viewed from above, straight, only slightly dilated before the apex, which is moderately acute; viewed from the side, each is directed downward, thickest at two-thirds its length, lower side with 7–8 denticles; apex hardly upcurved. Inferior appendage two-thirds as long,

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luteous, edged with black, broad; apex emarginate when viewed from below, ending in two upcurved denticles which do not reach the last denticle on the superiors.

Genitalia of 2 moderately prominent. Anterior lamina slightly more prominent than hamule or genital lobe, its apex slightly emarginate in the middle. Hamule bifid, branches widely divergent; internal branch when viewed from the side considerably thicker than the anterior lamina, its apex almost truncate, somewhat hooked on its outer side, a little less prominent than the anterior lamina; external branch much shorter, lying against the ventral margin of 2; apex rounded. Genital lobe rather broad, about as prominent as, or less so than, the internal hamular branch.

Wings hyaline, somewhat smoky; reticulation black, costa luteous anteriorly. Hind wings only with a small yellowish cloud alongside the membranule, never extending outward farther than a single cell. Pterostigma 4–5 times as long as wide; bright ocher yellow. Membranule cinereous, whitish at the base and along the alar side. Front wings with 11–14 antecubitals, 8–11 postcubitals, one hypertrigonal, one median cross vein, triangle with one cross vein, three rows of posttriangular cells, internal triangle of three cells. Hind wings with 9–10 antecubitals, 9–12 postcubitals, no hypertrigonals; triangle free, median cross vein placed nearer the base than the first antecubital; two rows of posttriangular cells increasing, no internal triangle; sectors of the triangle united at their origins.[1]

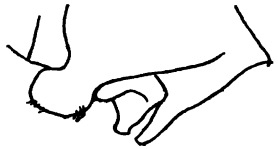

Fig. 6.
ORTHETRUM TRUNCATUM.
Side view of genitalia.

The female is unknown to me.

Measurements.—Total length, 40.5–43 mm. Abdomen, 27–30. Front wing, 30–33.5. Hind wing, 29–32.5. Pterostigma, 3–3.25. Width of abdomen at base, 2.5; at base of 4, 1.5; at apex of 6, 2.

Locality.—Six males in the National Museum collection, from Kilimanjaro.

At first, I had referred these specimens to *O. chrysostigma*, Burmeister (*O. barbara*, Selys). Mr. W. F. Kirby has kindly compared a tracing of the accompanying figure of the genitalia of *O. truncatum* with a male *O. chrysostigma* in the British Museum, with the result that the latter has the anterior lamina very short and slender (much less prominent than the hamule and less than the genital lobe); the hamule decidedly more prominent than the genital lobe, and in general "the genitalia agree with M. Albarda's[2] description as far as it goes." There are

[1] Variations in reticulation in the front wings: One male has no hypertrigonals in left wing; another has two cross veins in the right wing; a third has the internal triangle of two cells in the left wing. In the hind wings, the posttriangular series sometimes commences with three cells.

[2] Cf. Albarda, Ann. Soc. Ent. Belg., XXXI, p. 19, 1887.

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also some differences in color from *O. chrysostigma*, but these are of comparatively little importance.

It is quite possible that the two species of *Orthetrum* described as new in this paper are in reality identical with some of the species described by Burmeister or Rambur. As, however, I am unable to point out such an identity from the existing descriptions, it seems better to describe and figure the present material under new names than to run the risk of erroneous identifications. It is hoped that the present descriptions and figures will sufficiently characterize the species in question, so that those having access to types of previously described species may perceive the identity, if it exist. The genus *Orthetrum* is a difficult one, and a revision of its species, based on abundant material, is greatly to be desired. I would suggest that the most reliable specific characters are to be found in the genitalia of the male and the vulvar lamina of the female, on the lines adopted by M. Albarda.

ORTHETRUM BRACHIALE, Beauvois.

Libellula brachialis, Beauvois, Ins. Afr. Amér., p. 171, Neur., pl. 2, fig. 3, 1805.—Rambur, Névr., p. 62, 1842.—Selys, Ann. Soc. Ent. Belg., XXXI, p. 21, 1887.—Gerstäcker, Mitt. Naturh. Mus. Hamburg, IX, 1, p. 5, 1891.
Orthetrum brachiale, Kirby, Cat. Odon., p. 36, 1890.

Male.—Vertex dark brown or black. Frons roughly punctate, varying from light olive green to dark brown, according to age; the carinæ margining the "shield" are yellow in younger individuals; of the same color as the frons in older ones. Nasus and rhinarium light olive green to obscure luteous, according to age. Labrum obscure luteous, its margin sometimes black. Labium varying from luteous, unspotted, to the mentum black; lobes with a black spot on the inner margin. Occiput dark brown or black.

Prothorax pale green with small brown marks in younger males, pruinose in older; hind margin more or less emarginate in the middle.

Thorax (in dry specimens at least) light green in young males; brown and paler on the sides in those somewhat older; median dorsal carina blackish at apex; dorsum of thorax somewhat darker alongside of this carina, and occasionally forming a complete stripe from the anterior border to the antealar sinus; a blackish antehumeral stripe not reaching the anterior mesothoracic border below nor the antealar sinus above; a complete humeral stripe in the young males, giving off an anterior branch halfway up, in older males the humeral stripe exists only near the feet; a short black stripe in front of the spiracle, and on the lower part of the second lateral suture; latero-ventral metathoracic carina shining black. In old males the thorax is almost entirely pruinose.

Feet black, trochanters, bases of femora, front femora inferiorly, second tibiæ superiorly, often pale.

Abdomen, viewed from above, inflated at the base, compressed, narrowing to the base of 4, thence widening to 6, thence tapering to apex;

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10 as wide or wider than base of 4. In the young males the colors are: 1 light olive green, dorsum with a dark brown spot each side; 2 similar, dorsal spots, darker in front of and widest at the black, transverse median carina; 3 and 4 light brown, dorsum with a darker stripe each side reaching the apex but not the base; 5 and 6 blackish, with a light brown spot on each side of dorsum at middle; 7–10 black dorsally; 1–4 light brown ventrally; 4–7 blackish ventrally, an elongate brown spot on the middle, each side of the venter; with age, the abdomen becomes more and more pruinose.

Superior appendages about twice as long as 10, yellow in young, darker and even black in older males; viewed from above, each appendage is straight, dilated on the inner side before the apex, which is acute; viewed from the side, each is directed downward (but the apex slightly upward), with 8 or 9 denticles on the underside. Inferior appendage about a third shorter, luteous; viewed from the side, it forms a dorsally concave curve from base to apex, ending in the usual two denticles, which do not reach as far as the last denticle of the superiors (in only one male do they reach farther); viewed from below, the appendage is broad, triangular; apex black, truncated, slightly emarginate.

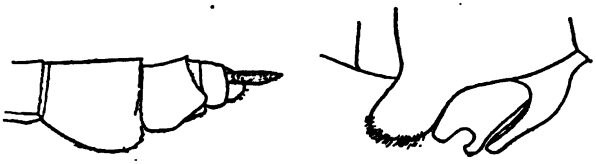

Fig. 7. Fig. 8.

ORTHETRUM BRACHIALE.

(7) Side view of last three abdominal segments, female; (8) Side view of genitalia, male.

Genitalia of 2 prominent. Anterior lamina much as in *O. brunnea*, with sides rounded to the apex, which is truncated and (usually) slightly emarginate. Hamule with apex bifid, branches parallel, of equal length;[1] internal branch rather slender, apex slightly hooked and directed outward; external branch twice as thick, apex rounded; genital lobe as pronounced as in *O. cœrulescens*, broad, apex rounded; the internal hamular branch projects slightly farther than the anterior lamina or the genital lobe.

Wings hyaline, with a slight smoky tinge, especially near the apex. Reticulation dark brown, costa yellowish anteriorly as far as the pterostigma. Hind wings with a small rufescent basal spot reaching from the submedian to the apex of the membranule and outward for one or two cells. Pterostigma dark brown, four times as long as broad. Membranule blackish brown, whitish at extreme base. Front wings with 12–16 antecubitals, 8–12 postcubitals, one hypertrigonal; triangle with one cross vein, internal triangle of three cells, three rows of post-triangular cells. Hind wings with 9–13 antecubitals, 10–13 postcubitals, no hypertrigonals, sectors of the triangle united or a little separated at

[1] Owing to the oblique position of the hamule, however, the internal branch appears more prominent than the external.

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their origin;[1] two (or three) rows of posttriangular cells; triangle free, no internal triangle.

The female differs from the male as follows:

Colors agree generally with those of younger males.

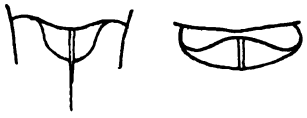

Fig. 9. Fig. 10.

ORTHETRUM BRACHIALE, Female.

(9) Ventral view of apical margin of vulvar lamina; (10) Apical margin of vulvar lamina, viewed from behind.

Abdomen a little dilated and compressed at base, thence gradually tapering to the apex; 3–6 like 5–6 in the male; lateral margins of 8 dilated as much as in *O. quadrupla*, Say; 10 yellow.

Vulvar lamina not projecting beyond the apex of 8, its margin entire, but slightly bent at the middle toward the abdomen, thus having the appearance of being emarginate; this bent portion has a very small median carina. Median ventral carina of 9 well developed.

Appendages yellow, more than twice as long as 10, but hardly as long as 9; apices acute, slightly brownish; tubercle between them yellowish, not quite half as long.

A very young male and female belong also to this species; they have the greater part of their bodies luteous, as in young imagoes of *O. cærulescens*, etc.

Measurements of Orthetrum brachiale.

	Male.	Female.
	mm.	mm.
Total length	41.5–48.5	43–44
Abdomen	28 –33.5	30
Front wing	32 –37	33–36
Hind wing	31 –36	32–35
Pterostigma	3 – 3.5	3– 4

Locality.—Two males and one female in the National Museum collection, from Zanzibar (one of these also marked "Tavüte, Jan., '89"); fourteen males, one female in the National Museum collection, from Kilimanjaro.

As indicated, the identification of this species as *O. brachiale* is somewhat doubtful; I have relied chiefly upon Baron de Selys' brief comparative description.[2] No detailed description of *O. brachiale* has hitherto been published. Dr. Hagen kindly examined one male and the female of the specimens from Zanzibar, and in September, 1890, wrote to me of them: "It is, I believe, the same species quoted by Burmeister (p. 857) as *L. sabina* (not published) from the Comores Isles, perhaps =*L. barbara*?." *L. sabina*, Burmeister, is not *sabina*, Drury, and the present species is not *barbara*, Selys (=*chrysostigma*, Burmeister). Dr.

[1] Variations in reticulation: Two males have no hypertrigonal in the right front wing; one has two hypertrigonals in the left front wing; two have a cross vein in the discoidal triangle of the left hind wing.

[2] Ann. Soc. Ent. Belg., XXXI, p. 21, 1887.

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Hagen's subsequent illness has prevented me from seeking further aid from him. In my report on the Odonata collected by the United States Eclipse Expedition to the Congo, I described a species under the name of *capensis*. I am now doubtful whether it is distinct from the present species, but the specimen is no longer before me.[1]

ORTHETRUM ABBOTTII, new species.

Wings hyaline, reticulation brownish, costa and some cross veins near base, yellowish; an extremely small fulvous cloud at base of the long veins; pterostigma yellow, its veins black, surmounting 2–3 cells; membranule whitish, darker on its free border. Front wings with 12–13 antecubitals, 9–10 postcubitals, one hypertrigonal; median cross vein more distant than first antecubital. Hind wings with 10 antecubitals, 9–10 postcubitals, no hypertrigonals, median cross vein nearer than the first antecubital; sectors of the triangle distinctly separated at their origins. Three rows of posttriangular cells in all four wings.

Male.—Vertex black, apex truncated. Frons, nasus, and rhinarium pale green; frons darker anteriorly between the two vertical carinæ and at the middle of the upper surface. A black line in front of the eyes. Lips yellow. Occiput black, rear of head yellow.

Prothorax pruinose, its hind margin slightly bilobed.

Thorax pruinose, median dorsal carina black; an oblique greenish yellow band on the sides just behind the spiracle followed by a black oblique band at the second lateral suture; posterior to this latter band the color is light green; latero-ventral metathoracic carina greenish.

Abdomen rather slender; viewed from above, base moderately inflated, becoming narrower to the base of 3, thence widening to 6, thence narrowing to apex; black, pruinose, some pale spots on the sides of 1, 2, and base of 3.

Superior appendages not as long as the last two segments, black, slender, straight, denticulated below, apices moderately acute. Inferior appendage one-fourth shorter, obscure luteous, edged with black, rather broad, its apex broad (one-third of length), rounded when viewed from below, ending in two denticles directed upward, not reaching as far as the last denticle of the lower side of the superiors.

Genitalia of 2 prominent. Anterior lamina more prominent than any other piece, swollen anteriorly when viewed in profile, the swollen portion covered with minute denticles; apex distinctly emarginate

[1] One male of the lot of *brachiale* from Kilimanjaro has the following imperfections in structure: The left hamule is normal, but the right hamule is entirely wanting, apparently not having developed. The anterior lamina is apparently represented only by a tubercle, better developed on the right side, and not projecting as far as the level of the point of bifurcation of the left hamule. The left superior appendage is normal, but the right one is nearly a third shorter, although with the same acute apex as these appendages normally have, and bears no inferior denticles. The left lateral margin of 8 is dilated as in the female, and there is a rudiment of a similar dilatation on the right side. In all other particulars this male seems to be normal.

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from side to side. Hamule with its apex bifid; internal branch rather slender, apex blunt, external branch shorter, twice as broad, apex truncated. Genital lobe not as prominent as the internal hamular branch.

Feet black, femora yellow superiorly.

Fig. 11.
ORTHETRUM ABBOTTII, Male.
Side view of genitalia.

Female.—Face and lips luteous, a black line in front of the eyes. Vertex and occiput dark brown. Rear of the head luteous.

Thorax luteous; summit of the median dorsal carina, a short line at the summit of the first and second lateral sutures, rim of the spiracle and margins of antealar sinus, black.

Abdomen of almost equal width throughout, luteous, carinæ and anterior sutures black; a lateral marginal black stripe on 4–7; dorsum of 8 black with a luteous stripe each side, except at apex; dorsum of 9 black; dorsum of 10 black with two small apical luteous spots. Lateral margins of 8 somewhat dilated (about as much as in *O. brunnea*).

Appendages straight, simple, black, a little longer than 10; tubercle between them luteous.

Vulvar lamina simple, margin straight, entire, not projecting farther than the apex of 8.

Feet: Femora superiorly luteous, inferiorly black; tibiæ superiorly bright yellow, inferiorly black; tarsi black.

Measurements of Orthetrum abbottii.

	Male.	Female.
	mm.	*mm.*
Total length	36	35.5
Abdomen	25	24
Front wing	28.5	29
Hind wing	28	28
Superior appendages	1.5	.....
Appendages	.....	.9
Pterostigma	3.5–4	3.5

Locality.—One male and one female in the National Museum collection, from Kilimanjaro.

ORTHETRUM WRIGHTII, Selys.

Libellula wrightii, SELYS, Ann. Soc. Ent. Belg., XII, p. 96; Ann. Mag. Nat. Hist. (4), III, p. 272, 1869.

Orthetrum wrightii, KIRBY, Cat. Odon., p. 182, 1890.

Libellula desjardinsii, SELYS, in Pollen & Van Dam, Faune Madag., Ins., p. 22, 1869; Rev. Mag. Zool., 1872, p. 182.

Male.—Face pale olive or luteous. Frons blue-black anteriorly and on the sides, which is continuous, with a black stripe in front of the eyes and vertex, the black thus inclosing a pale olive spot on the upper surface of the frons, and also a small yellow spot on the sides inferiorly; below the horizontal carina luteous. Labrum luteous, free margins

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edged with black, and traversed by a median black stripe. Labium: Mentum and inner margin of lobes black, remainder of lobes yellowish. Vertex and occiput black. Rear of eyes luteous, with two black spots.

Anterior and middle lobes of prothorax black, their anterior margins yellowish. Posterior lobe obscure yellowish, barely notched in the middle of the hind margin.

Thorax yellowish brown, with black stripes as follows: A broad median dorsal reaching the antealar sinuses, an antehumeral not reaching the sinus; a broader humeral; an oblique lateral, in which the spiracle lies, and which is closely connected with a similar parallel stripe in front of itself; a stripe on the second lateral suture, and an incomplete oblique stripe behind the suture; these stripes are more or less confluent below; the median dorsal and antehumeral are connected inferiorly by a transverse anterior mesothoracic stripe. Latero-ventral metathoracic carina black. Interalar pieces mostly yellowish. Pectus obscure luteous.

Feet black, coxæ marked with luteous, first femora luteous inferiorly. Hind tibiæ with 7 outer, 10–11 inner spines.

Abdomen shaped as in *O. brachiale*, Beauvois; black, marked with yellowish or reddish brown, as follows: 1 with a small dorsal and a small lateral spot; 2 with a larger dorsal and two lateral spots; 3 with two pairs of dorsal spots, one pair smaller and in front of the middle transverse (supplementary) carina, the other larger and behind the carina, and a lateral spot; 4–6 with a dorsal spot on each side of longitudinal carina, near the middle of the segments; on 5 and 6 each spot is almost divided longitudinally into two; 3–8 with a ventral spot on each side.

Fig. 12.

ORTHETRUM WRIGHTII, Male.

Side view of genitalia of second abdominal segment.

Superior appendages yellowish, not as long as the last two segments; of the shape described for *O. truncatum*; inferior denticles very small. Inferior appendage yellowish, similar to that of *O. truncatum*.

Genitalia of 2 rather prominent, black. Anterior lamina longer than any other piece, its apex rounded, barely notched; viewed from the side it is quite slender. Hamule with apex bifid, branches approximately of equal length when viewed laterally; internal (anterior) branch slender, with a very acute apex directed outward; external branch much broader, somewhat lamellar, apex broad, truncate, angles rounded. Genital lobe rather broad, rounded, projecting equally with the internal hamular branch.

Wings hyaline, only the faintest tinge of yellow at extreme base of posteriors. Pterostigma dark brown. Membranule cinereous, slightly whitish at base. Reticulation black. Front wings with 12–13 antecubitals, 9 postcubitals, one hypertrigonal; discoidal triangle of two cells; internal triangle of three cells; three rows of posttriangular cells; one median cross vein. Hind wings with 10 antecubitals, 10–11 postcubitals, no hypertrigonals, one median cross vein (2 in left wing),

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triangle free, two posttriangular rows; inner side of triangle lying slightly beyond the arculus (a distance equal to that part of the arculus from its lower end to the origin of its sectors); sectors of the triangle united at their origin.

The female differs from the male as follows:

Lower half of median dorsal carina yellowish. Yellow of thorax brighter. Abdomen shaped much as in the female of *O. brachiale;* 2 with a small dorsal yellow spot in front of the spot corresponding to that described for the male; 7 with a small lateral spot; 10 with a small dorsal spot. Sides of 8 dilated. Appendages a little longer than 10, yellow, straight, apex acute. Vulvar lamina not prolonged beyond apex of 8; margin entire, not bent in the manner described for *O. brachiale.* Front wings with 13–14 antecubitals, 8–9 postcubitals. Hind wings with 10–11 antecubitals, 10 postcubitals, one median cross vein, inner side of triangle in prolongation of arculus; sectors of triangle separated (right wing) or united (left wing) at their origins.

Measurements of Orthetrum wrightii.

	Male.	Female.
	mm.	mm.
Total length	41	40
Abdomen (incl. app.)	28	28
Front wing	30	30
Hind wing	29	29
Pterostigma	3	3
Superior appendages	1.75	.....
Appendages	.....	1

Locality.—One male and one female in the National Museum collection, from the Seychelles, collected by Dr. W. L. Abbott.

ONYCHOGOMPHUS COGNATUS, Rambur.

Gomphus cognatus, RAMBUR, Névr., p. 167, 1842.

Onychogomphus cognatus, SELYS, Bull. Acad. Roy. Brux., XXI, Pt. II, p. 38 (Syn. Gomph., p. 19), 1854; Monog. Gomph., p. 56, 1858.—KARSCH, Ent. Nach., XVI, p. 377, 1890.

Lindenia cognata, KIRBY, Cat. Odon., p. 59, 1890.

Two males in the National Museum collection, from Kilimanjaro, belong to this species, but differ from the description of the male given by Baron de Selys[1] as follows:

The dark marks of the face and lips are brown. In one male the "large raie transverse en avant, au sommet du front" is wanting.

There are no spines on the occiput.

There is a group of 6–8 black denticles on each side of the upper surface of the frons.

The thoracic stripes are brown; the median dorsal bands are not broad and do not join the antehumeral bands; there is a stripe on the second lateral suture, and a stripe from the spiracle to between the

[1] Monog. Gomph., p. 57.

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second and third coxæ; the humeral stripe is narrow and not well defined.

The coloring of abdominal segments 2–7 is more like that of the female of the Stockholm collection than of the male.

Stripes on the feet brown, rather ill defined.

Antecubitals 11–12 on front wings, 8–9 on hind wings, 6–8 postcubitals on all wings. First and fifth antecubitals thicker on all wings. No subcostal cross vein (of Karsch). Three cells after the triangles, then two rows.

Measurements.—Total length, 43 mm. Abdomen, 33. Front wing, 26–27. Hind wing, 25–26. Pterostigma, 3.5. Superior appendages, 3.

One male has lost the last four abdominal segments.

In spite of the differences described above, I believe these specimens to belong to *O. cognatus* (Rambur) Selys, because the appendages, the size of the body, and the pterostigma agree with the description thereof. The most serious differences are the absence of the occipital spines and the presence of the frontal denticles.

ANAX RUTHERFORDI, McLachlan.

Anax rutherfordi, McLachlan, Ent. Mo. Mag., XX, p. 128, 1883.—KIRBY, Cat. Odon., p. 85, 1890.

Female.—Frons, nasus, and rhinarium pale greenish yellow; no spot on the frons. Labrum and labium a little more obscure. Free margin of the labrum slightly edged with blackish. Mandibles exteriorly pale yellow, their tips black. Vertex blackish, its tip light brown, forming a crescent, concave anteriorly, when viewed from above. Occiput and rear of the head brownish yellow; hind margin of the occiput concave.

Colors of the thorax changed; perhaps greenish on the side, darker on dorsum.

Abdomen stout, base inflated, thence tapering gradually to 7, apex a little wider. A supplementary lateral carina on 6–10, but faintly marked on 6 and 10. Between the two lateral carinæ of each side of 6–9 are some blackish marks. A cluster of fine black denticles on the median apical dorsum of 2; ventral apex of 10 with numerous slightly larger black denticles. General color of the abdomen reddish brown in the dried specimen; a basal black spot on 1; an apical black spot on 2–8, interrupted and divided into two spots by the dorsal carina on 5–7; a median dorsal black spot on 9; 10 paler than the preceding segments, apparently unspotted.

Appendages leaflike, reddish brown, a little longer than the last two segments, apices moderately acute.

Femora reddish, tibiæ and tarsi black.

Wings hyaline, smoky along the posterior margin. Reticulation reddish brown about as far as the nodus, then becoming dark brown or black; the costa remains a light brown, however, for nearly its entire length. A yellow cloud at the base of all the wings between the costa

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and the postcostal, not reaching as far as the first antecubital. Pterostigma dark reddish brown, surmounting 3–4 cells, its internal vein prolonged to the principal sector. Membranule with basal half white, apical half cinereous. Front wings with 21 antecubitals, the 1st and 7th thicker than the others; 11 R, 10 L postcubitals, 4 hypertrigonals; triangles of 6 cells, 2 cells being on the inner side; internal triangle present, with one cross vein; three other median cross veins, all nearer the base than the arculus; subnodal sector with six inferior branchlets (including the inferior terminal fork); arculus joining the median nerve at the second antecubital. Hind wings with 15 R, 14 L antecubitals, 1st and 7th thicker; 12 R, 14 L postcubitals, 4 R, 3 L hypertrigonals, triangle of 6 R, 5 L cells (but with a rudiment of the vein forming the 6th) as in front wings; internal triangle present, with one cross vein; two other median cross veins, nearer than the arculus; subnodal sector and arculus as above; no anal triangle.

Measurements.—Length, 79 mm. Abdomen, 59. Front wing, 60. Hind wing, 59. Appendages, 5.5. Pterostigma, 5.5. Breadth of head, 10.5

Locality.—One female in the National Museum collection, from Kilimanjaro.

The female of this species has not hitherto been described. Mr. McLachlan's types were two males from Sierra Leone. The female above described seems to belong to the same species. The two males are stated to agree in size with *A. speratus*, Hagen,[1] whose measurements are: Length, 72 mm.; abdomen, 51; wings, 56; pterostigma, 5.5; appendages, 7; alar expanse, 116; width of head, 10.5. The present female is somewhat larger, but a greater range of size is known for other species of *Anax* (*longipes*, *junius*, etc.). That *A. rutherfordi* should be found at a locality so distant from Sierra Leone as Kilimanjaro is in accordance with the strong powers of flight possessed by the species of *Anax* and with what we know of the distribution of other African species of this genus. Mr. McLachlan[2] records *A. goliath*, Selys, from Abyssinia and from Jellah Caffee, in West Africa. The types of Selys came from Madagascar. *Hemianax ephippigerus*, Burmeister, occurs in the Congo and Senegal countries, Morocco, Algeria, Egypt, Western Asia, Turkestan, Arabia, the Himalayas, in Moldavia, and occasionally elsewhere in Europe.[3]

ÆSCHNA RILEYI, new species.

Female.—Frons, nasus, rhinarium, and lips brown. Frons darker above, with a yellow half ring inclosing a nearly round dark-brown spot which reaches to the vertex; a yellow line in front of the eyes becomes confluent with this half ring, which latter is slightly inter-

[1] Verhd. zool.-bot. Gesell. Wien, 1867, p. 46.
[2] Ent. Mo. Mag., XXI, p. 131.
[3] Selys, Ann. Soc. Ent. Belg., XXXI, p. 37, 1887.

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rupted anteriorly, so that the inclosed round spot becomes confluent with the brown of the frons at this point. Vertex dark brown, with a crescentlike yellow tip; concave anteriorly. Occiput triangular, yellow above and behind, its lateral angles and the rear of the head black.

Thorax brown, dorsum with a short antehumeral yellow line from the anterior mesothoracic border halfway up to the antealar sinus; a very narrow yellow humeral line, slightly wider at the sinus. Sides with two broad oblique yellow bands, margined with shining black, one beginning under each pair of wings, but not attaining the bases of the feet. Antealar sinuses and some spots on interalar space yellow.

Feet: Bases and femora reddish brown, apices of femora, tibiæ, and tarsi black. Spines of the hind tibiæ on the inner and outer sides equal in number and length.

Abdomen distorted in this specimen, but apparently inflated at the base, thence gradually tapering to the apex; brown in the dried condition and marked with yellow as follows: A transverse stripe margined with black on each side, near the middle of the dorsum of 2, but not meeting on the median carina; 3–7 with a median dorsal triangular spot a little in front of the middle of the segment; 2 and 3 at base and 6–9 with a lateral spot; no supplementary lateral carinæ; 10 denticulated ventrally.

Fig. 13.

ÆSCHNA RILEYI.

Frons and vertex, viewed from above.

Appendages brown, leaf-like, a little longer than the last two segments; rather narrow, with a slight dorsal longitudinal carina; apices rounded.

Wings hyaline, reticulation dark brown, costa yellowish anteriorly to some distance beyond the nodus. Pterostigma yellow-brown, surmounting 3–3½ cells; internal vein prolonged to principal sector. Membranule white, apical third grayish. Subnodal sector with three inferior branchlets (including the terminal one). Upper sector of the arculus arising perceptibly above the middle of the arculus, which latter meets the median vein at the level of the third costal antecubital on the front wings. Two hypertrigonals (three on left hind wing). Triangle of four cells, two on the inner side. Internal triangle present, with one cross vein; four other median cross veins on the front wings, three other on the hind wings, all nearer the base than the arculus. Front wings with 17 R 16 L antecubitals, first and seventh thicker; 12 R 11 L postcubitals, five posttriangular cells, then two rows increasing. Hind wings with 10 antecubitals, first and sixth thicker; 13 R 12 L postcubitals; four posttriangular cells, then three rows increasing.

Locality.—One female in the National Museum collection, from Kilimanjaro. The male is unknown to me.

The coloration of the superior surface of the frons (Fig. 13) is characteristic of this species. I have named it after the late Dr. C. V. Riley, United States Entomologist, to whom I am indebted for the opportunity of studying several collections of Odonata.

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PHAON IRIDIPENNIS, Burmeister.

Calopteryx iridipennis, BURMEISTER, Handb. Ent. II, p. 827, 1839.—WALKER, List Neur. Ins. Brit. Mus., p. 609, 1853.

Euphœa iridipennis, RAMBUR, Névr., p. 232, 1842.

Phaon iridipennis, SELYS, Syn. Calopt., p. 24, 1853; 4e Add., p. 13, 1879; Monog. Calopt., p. 70, pl. 3, figs. 3, 4 (wings), 1854; Enum. Odon. Madag., p. 24, 1869.—KIRBY, Cat. Odon., p. 101, 1890.

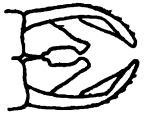

Fig. 14.
PHAON IRIDIPENNIS, male.
Dorsal view of abdominal appendages.

One male in the National Museum collection, from Zanzibar, belonging to the typical form, *P. iridipennis*, having a pterostigma.

DISPARONEURA ABBOTTI, new species.

Male.—Black with the following markings:

A yellow band running across the front of the head from eye to eye, just above the epistoma.

Labium and palps yellow, except the tips of the palps which are black.

Anterior, posterior, and lateral margins, a small double spot on the middle of the prothorax, and sometimes one on each side, yellow.

Thorax with a narrow antehumeral stripe, not attaining the antealar sinus, a broad oblique band in which lies the spiracle; all the side posterior to the black stripe which lies upon the whole length of the second lateral suture, and the pectus, greenish.

Coxæ, trochanters, and femora mainly yellowish, the black upon the latter reduced to a superior stripe, which, however, occupies nearly the entire second and third femora at their apices, and nearly all the first femora.

Abdomen: A narrow longitudinal median dorsal stripe on 2, reaching from the base to a little more than half its length; a narrow basal ring on 3–6 interrupted on the median line; apical dorsum of 9 with a triangular spot whose truncated apex, directed forward, is distant from the base of the segment by about one-fourth the segmental length; dorsum of 10; inferior lateral margins of 1–8, confluent with the basal rings on 3–6, all yellow.

Superior appendages yellow, of the length of the last segment, tapering slightly from base to apex, which latter is slightly thickened interno-inferiorly; each appendage apparently bears an intero-inferior basal tooth. Inferior appendages a little longer and darker than the superiors, moderately slender and curved somewhat toward each other in their apical halves.

Wings hyaline, yellowish. Pterostigma black, rhomboidal, surmounting one cell. Median sector arising from the vein of the nodus, the subnodal a short distance after. Lower sector of the triangle arising from the posterior margin of the wing about as far behind the

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postcostal cross vein as the latter is long, and ending near the middle of the cross vein *one cell after* the vein which terminates the quadrilateral and the space under it.[1] Sixteen postcubitals on the front wings, thirteen on the hind wings. Superior sector of the triangle ending on the posterior margin at about the sixth cell after the quadrilateral.

Measurements.—Total length, 47 mm. Abdomen, 41. Front wing, 26. Hind wing, 25. Superior appendages, 0.6. Pterostigma, 1.

Locality.—Two males in the National Museum collection, from Kilimanjaro; the last seven abdominal segments of one of them are wanting. The female is unknown to me.

In his "Revision du Synopsis des Agrionines,"[2] Baron de Selys arranges the species of *Disparoneura* in two divisions, of which the first is characterized by the "median sector *arising from the vein of the nodus*, the subnodal a little after. The rudiment of the lower sector of the triangle parting from the posterior border *a little more remote than the basal postcostal nervule* and ending at the middle of the vein which terminates the space under the quadrilateral." The second division has the "subnodal sector arising from the vein of the nodus, the median[3] a little in front of this vein." The first division embraces but one species, *D. subnodalis*, Selys; the second, twenty-two (including *D. delia*, Karsch, 1891).

D. abbotti belongs to the first division, whose characters must be modified as follows:

Median sector arising from the vein of the nodus, the subnodal a little after. Lower sector of the triangle arising from the hind margin of the wing farther from the base than the basal postcostal cross vein.

a. Lower sector of the triangle ending at the middle of the vein which terminates the space under the quadrilateral..... *D. subnodalis*, Selys.

b. Lower sector of the triangle ending near the middle of the vein one cell after that which terminates the space under the quadrilateral... *D. abbotti*, new species.

D. subnodalis is also described as having a blue band on each side of the head between the epistoma and the eye (apparently not uninterrupted from eye to eye as in *abbotti*), and on each side of the thorax two small pale juxtahumeral spots placed one above the other (wanting in *D. abbotti*).

DISPARONEURA MUTATA, Selys (?).

Disparoneura mutata, Selys, Rev. Syn. Agr., p. 164, 1886.—Kirby, Cat. Odon., p. 133, 1890.

Locality.—One male in the National Museum collection, "Taviite, Zanzibar, January, 1889."

[1] In the left front wing of one male, the lower sector of the triangle ends at the vein which terminates the space under the quadrilateral.

[2] Mem. Cour. Acad. R. Belg., XXXVIII, 4, 1886, p. 162.

[3] The original has "sous-nodal" instead of "médian"—an evident misprint.

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I would have no hesitation in referring this male to *D. mutata*, Selys, were it not that his description of the appendages as seen in profile ("de profil on les voit dilatés en dessous en une dent médiane triangulaire") does not mention the *two* teeth shown in my figure (Fig. 15). The question arises: Can the appendages of the type be partly retracted within the last segment so as to hide the more basal of the two teeth?

Fig. 15.
DISPARONEURA MUTATA (?), Male.
Side view of abdominal appendages.

AGRION INSULARE, Selys (?).

Agrion insulare, SELYS, Rev. Mag. Zool., p. 179, 1872; Bull. Acad. Belg. (2), XLI, p. 1288, 1876.
Cœnagrion insulare, KIRBY, Cat. Odon., p. 150, 1890.

One male in the National Museum collection, from the Seychelles, collected by Dr. W. L. Abbott, may belong to this species. The last three abdominal segments are wanting. It differs from the description of Baron de Selys[1] as follows:

Pterostigma covers one and a half cells on front wings, two cells on hind wings; 14–15 postcubitals. No black marks on labrum. A small linear yellow spot each side of vertex. Postocular spots represented by a metallic green patch. All but the head (and wings?) of the type (male) are wanting.

Dorsum of prothorax and thorax metallic green. Prothorax with hind margin rounded, entire. Sides of thorax pale blue (?), a metallic green band on the first lateral suture, a black one on the second lateral suture; both complete.

Feet luteous, with a superior black line.

Dorsum of first three abdominal segments metallic green, of 4–7 black; sides and below, light blue; a basal blue ring on 3–7, interrupted dorsally.

Measurements.—Length of head, thorax, and first 7 abdominal segments, 38 mm. Front wing, 24. Hind wing, 23. Pterostigma, 1.5.

PSEUDAGRION PRÆTEXTATUM, Selys.

Pseudagrion prætextatum, SELYS, Bull. Acad. Belg. (2), XLIII, p. 494, 1876.—KIRBY, Cat. Odon., p. 153, 1890.

Thirteen males and six females in the National Museum collection, from Kilimanjaro, belong apparently to this species. Only one male has the abdomen complete, and its appendages are in such bad condition as to afford no help in identification. The colors of these specimens agree with the description. The younger males have the sides of the thorax pale green, a short black stripe at the base of the front wings, no black marks on the pectus, the abdomen with a greenish metallic or bluish metallic luster.

[1] Bull. Acad. Belg. (2), XLI, p. 1288, 1876.

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NOTES ON THE ODONATA FROM EAST AFRICA, COLLECTED BY THE CHANLER EXPEDITION.

By PHILIP P. CALVERT.

THE National Museum, through Dr. Riley, has sent to me for study and identification the Odonata collected by Mr. W. A. Chanler's expedition to East Africa in 1892–93. All of the specimens mentioned below, 19 in number, are from the Tana River. They represent seven species, all well known to occur in Africa. Bibliographical references, in addition to those here cited, may be found in Mr. Kirby's Catalogue of the Odonata (London, 1890).

UROTHEMIS EDWARDSII, Selys.

Libellula edwardsii, SELYS, Explor. Alger. Zool., III, p. 124, Névr., pl. 2, figs. 5, 5*a*, (1849).

Urothemis edwardsii, SELYS, C. R. Ent. Belg., XXI, p. lxv (1878).—CALVERT, Proc. U. S. Nat. Mus., XVI, 1893, p. 585, fig. 11.

One male (abdomen, 26 mm.; hind wing, 34.5) agrees with my figure (of the genitalia) above cited. The coloring of the hind wings differs but slightly from that described for the three males from Congo in the same paper[1], viz, that the blackish-brown basal streaks in the subcostal and half of the costal space reaches to the first antecubital. This description quoted speaks of the basal spot on the hind wings as "not reaching the anal border;" "hind" should be substituted for "anal."

A second male (abdomen, 24.5 mm.; hind wing, 34) agrees with the fourth male from Congo, described in the same paper by myself. I still think it possible that *Libellula sanguinea*, Rambur (not Burmeister), may be the younger male of the same species as *edwardsii*.

A female (head, thorax, and first four abdominal segments=21 mm. long, hind wing 32.5), last six abdominal segments wanting; apparently belongs to the same species as the last-mentioned male; in general it agrees with Rambur's description of his *signata*, but *signata* is there stated to have a wing expanse of 8 cm. and to be 5 cm. long.

[1] Calvert, Proc. U. S. Nat. Mus., XVI, 1893, p. 585.

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TRITHEMIS RUBRINERVIS, Selys.

Libellula rubrinervis, SELYS, Rev. Zool., 1841, p. 244; Explor. Alger. Zool., III, p. 120, Névr., pl. 1, fig. 5 (1849).

Trithemis rubrinervis, CALVERT, Proc. U. S. Nat. Mus., XVI, 1893, p. 585, figs. 8, 9.

Two males, one female. No black on the labium. Abdomen: male 23–25, female 21; hind wing: male 28–30.5, female 29.

CROCOTHEMIS ERYTHRÆA, Brullé.

Libellula erythræa, BRULLÉ, Exped. de Morée, III (1), p. 102, pl. 32, fig. 4 (1832).

Crocothemis erythræa, CALVERT, Proc. U. S. Nat. Mus., XVI, 1893, p. 585, fig. 10.

Two females, abdomen 24.5, hind wing 31.5; sectors of the triangle of the hind wings separated at their origins. It closely resembles *Trithemis ferrugaria*, Rambur, of the same country, but differs in the stouter abdomen, and in the vulvar lamina being more nearly erect and not reaching as far as the apex of the tenth abdominal segment. It must be mentioned, however, that the vulvar lamina in these two females is relatively longer than in European specimens of *C. erythræa*.[1]

CACERGATES UNIFASCIATA, Olivier (teste Selys).

Cacergates unifasciata, CALVERT, Proc. U. S. Nat. Mus., XVI, 1893, p. 585, figs. 6, 7.

Two males, six females; no trace of the dark-brown band on the wings of the females. Abdomen: male 18, female 16.5–18; hind wing: male 25.5, female 24–25.

DIPLACODES LEFEBVREI, Rambur.

Libellula lefebvrei, L. parvula, L. flavistyla, RAMBUR, Névr., p. 112, 116, 117, 1842.

Libellula flavistyla, SELYS, Explor. Alger. Zool., III, p. 124, Névr., pl. 1, fig. 7, 1849.

One male, last four abdominal segments wanting. Genitalia not prominent. Anterior lamina almost flat, projecting less than any other part; margin entire. Hamule small, its apical fourth bifid, inner branch slender, slightly curved but not hooked, apex acute; outer branch

[1] Dr. Karsch writes (Berlin. Ent. Zeit., XXXVIII, p. 23, footnote, 1893), "Calvert recently erects (Trans. Am. Ent. Soc., XIX, 1892, p. 162) a *Trithemis erythræa* Brullé; this is an untenable mode of designation, since Brauer described a true *Trithemis* from the Island of Mauritius, very different from *Libellula erythræa*, Brullé, as *Trithemis erythræa*, which indeed is vainly to be sought for in Kirby's Synonymic Catalogue of Neuroptera Odonata, London, 1890." The reply to this criticism is that the *erythræa* from Mauritius described by Brauer (Verh. k. k. zool.-bot. Gesell. Wien, XVII, p. 814, 1867), is a *Tramea* and not a *Trithemis*, and is to be found in Kirby's Catalogue, p. 4. One may surmise that Dr. Karsch has merely copied the error of de Borre's "Repertoire Alphabetique," etc. (Mem. Roy. Soc. Sci. Liege (2), XVI, No. 4, 1889), where, on p. 18, *C. erythræa*, Brauer, with the reference to the Verh. k. k. zool.-bot. Gesell., etc., just given, is incorrectly referred to *Trithemis* instead of *Tramea*. Dr. Brauer, in his "Verzeichniss der Neuropteren" of 1868 does not mention his own *erythræa*.

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wider, apex obliquely truncated. Genital lobe projecting farthest, wider just before the apex than at the base; apex regularly and symmetrically rounded.

ORTHETRUM BRACHIALE, Beauvois.

Libellula brachiale, BEAUVOIS, Ins. Afr. Amer., p. 171, Nevr., pl. 2, fig. 3, 1805.—SELYS, Ann. Soc. Ent. Belg., XXXI, p. 21, 1887.—RAMBUR, Nevr., p. 62, 1842.—GERSTÄCKER, Mitt. Naturh. Mus. Hamb., IX, 1, p. 5, 1891.
Orthetrum brachiale, CALVERT, Trans. Am. Ent. Soc., XIX, p. 162, 1892.

One female, abdomen 31, hind wing 33. The vulvar lamina differs from my description quoted above, in that its apical margin is not "bent toward the abdomen in the middle," but I do not believe that this indicates anything more than a difference in the manner of drying.

ORTHETRUM TRINACRIA, Selys.

Libellula trinacria, SELYS, Rev. Zool., 1841, p. 244; Rev. d'Odon. Eur., p. 4, 1850; Ann. Soc. Ent. Belg., XXXI, p. 19, 1887.—MCLACHLAN, Jour. Linn. Soc. Lond., Zool., XVI, p. 178, 1882.

One female, abdomen 39, hind wing 37, pterostigma 4.5. From De Selys' description[1] it differs only in the following minor points: The yellow of the rear of the eyes is not spotted with black; the only distinguishable markings on the luteous thorax are a very slender brown antehumeral stripe and an obscure dark line on the upper part of the humeral suture. It agrees with the distinctive specific characters, viz, the abdomen distinctly compressed and vesiculose at base, and the absence of yellow at the base of the hind wings, and it possesses 10–11 antecubitals on the front wings.

[1] Rev. d'Odon. Eur., p. 4, 1850.

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ON THE PROPER NAME OF THE GUNNELS OR BUTTER-FISHES.

By THEODORE GILL, LL. D.

THE FISHES known by the book name of gunnels, and more generally designated by fishermen and shoremen as butter-fishes, have been mostly accredited with the Latin names *Muræenoides*, *Centronotus* and *Gunnellus*. The object of the present communication is to show that not one of these names is eligible, and that all have to be superseded by a still older name, *Pholis*.

I.

In 1758, *Ophidion* was considered by Linnæus[1] as a genus of *Jugulares*, and diagnosed as follows:

131. OPHIDION. *Caput* nudiusculum. *Membr. branch.* patula radiis V. *Corpus* ensiforme. *Pinna* dorsalis anique unita caudæ. Pinnæ *ventrales* radiis duobus: exteriore spinoso.

barbatum.	1. = Ophidium barbatum.
imberbe.	2. = Pholis gunnellus.
macrophthalmum.	3. = Cepola macrophthalma.

The description was evidently based on the gunnel.

In 1766 *Ophidium* was placed by Linnæus[2] as a genus in the order *Apodes*, and redefined as follows:

148. OPHIDIUM. *Caput* nudiusculum. *Dentes* maxillis, palato, faucibus. *Membr. branch.* radiis VII, patula. *Corpus* ensiforme.

barbatum.	1.
imberbe.	2.

The description is more applicable to *Ophidium* than to the gunnel, if we take cognizance of the fact that Linnæus considered the chin appendages as barbels ("cirris quatuor") and not anomalous ventrals. Inasmuch as (1) the *barbatum* was the first species of the genus in both cases, (2) the ancient name referred to it, (3) Linnæus himself considered it as the type of the genus, notwithstanding his diagnosis, and (4) the name *Ophidium* has been used universally for it, it seems best to retain the name with the usual acceptation.

[1] Systema Naturæ, ed. x, I, p. 259.

[2] Systema Naturæ, ed. xii, I, p. 431.

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We are thus simply following out the principle of subordinating the description to usage and restriction by elimination to a natural genus. As this usage will not entail change it will doubtless be generally acceptable. *Ophidion* and *Ophidium* can not be used for different genera, the latter being simply an improved form of the earlier name. Some if not most of the American zoologists will probably prefer the earlier form, *Ophidion*.[1] I am, however, disposed under the circumstances to accept the later name, *Ophidium*.[2]

II.

In 1763 Gronovius, in his "Zoophylacium," established a new genus called *Pholis* (p. 78) for the *Blennius gunnellus*, and this was the only species mentioned, though he evidently had others in mind.[3] The most distinct generic characters were the extent and structure of the dorsal fin.[4]

The genus of Gronovius, in the opinions of many, at least, is inadmissible, as that author had not yet become a binomialist. The single species of *Pholis*, for example, was named "Pholis maculis annulatis ad pinnam dorsalem; pinnis ventralibus obsoletis." Nevertheless a few would admit his genera. In the special case under consideration, fortunately, there need be no conflict, as the genus *Pholis* was soon reenforced by a binomialist.

Scopoli, in 1777,[5] introduced the genus under his "Gens III, Ano medio," and "Divisio II, Thoracici," in the following terms:

"288. PHOLIS Gronov. Dorsum infra medium pinnatum. Pinnæ ventrales nullæ, harumque loco ramenta pectoralia. Hisce notis, ut & ani situ differt a Blennio.

The genus was thus reenforced, and the type is of course the only species mentioned by Gronovius—*Pholis gunnellus*=*Blennius gunnellus*, Linnæus.

It is not evident what Gronovius and Scopoli meant by the statement that the dorsal commenced at the middle of the length ("a dorso medio"), as the figure published by Gronovius correctly represents the dorsal commencing near the nape. There can, nevertheless, be no doubt that *Pholis* was based on the common gunnel, and that being the first name (after *Ophidion*) it should be adopted for the genus.

Subsequent names do not require much consideration.

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[1] The *Ophidion imberbe* is conspecific with the *Blennius gunnellus* described by Linnæus on a previous page (p. 257) of the same volume. The ventrals of *B. gunnellus* had the same formula as those of *O. imberbe* ("V. 2").

[2] The *O. macrophthalma* of the tenth edition was transferred to the new genus *Cepola* and named *C. rubescens* in the twelfth (p. 445). The proper name of that species, therefore, is *Cepola macrophthalma*.

[3] *Pinnæ* V. vel. VII. . . . *Ventrales* in quibusdam nullae, nisi Ramenta obtusa in pectore sub pectoralibus pro pinnis habentur, in aliis vero sunt distinctissimae. *Gronovius* in diagnose generis, p. 78.

[4] *Dorsalis* unica, a dorso medio usque ad caudam extensa, & ossiculis parum aculeatis suffulta.

[5] Int. Hist. Nat., p. 456, 1777.

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III.

In 1800 Lacépède, failing to recognize the identity of *Blennius muræoides* with *B. gunnellus*, isolated the former as representative of a distinct genus, *Muræoides*, while he retained the latter in the genus *Blennius*.

IV.

In 1801 Bloch and Schneider established the genus *Centronotus*, with the following diagnosis: "Corpus gracile, pinna dorsi longitudinalis, tota aculeata."

V.

In 1815 Rafinesque proposed *Dactyleptus* as a substitute for *Muræoides*, because he did not like the latter.

VI.

In 1817 Cuvier renamed the same genus "*Les Gonnelles*," and later the latinized form *Gunnellus* was introduced by Fleming.

VII.

In 1839 Swainson substituted for *Gunnellus* the new name *Ophisomus*, because it was not derived from the Greek or Latin.[1]

VIII.

The further history is summarized in the following synonymy:

Genus PHOLIS.

<*Ophidion*, LINNÆUS, Systema Naturæ, ed. x, I, p. 259, 1758.
<*Pholis*, GRONOW, Zoophylacium, p. 78, 1763. (Not binomial.)
<*Ophidium*, LINNÆUS, Systema Naturæ, ed. XII, I, p. 431, 1766.
<*Pholis*, SCOPOLI, Int. Hist. Nat., p. 456, 1777.
<*Muræoides*, LACÉPÈDE, Hist. Nat. des Poissons, II, p. 324, 1800.
<*Centronotus*, BLOCH, Systema Ichthyologiæ, ed. Schneider, p. 165, 1801. (Not *Centronotus*, Lacépède, 1802.)
<*Dactyleptus*, RAFINESQUE, Anal. Nat., p. 82, 1815.
= *Les Gonnelles* (*Muræoides*, LACÉPEDE, *Centronotus*, SCHNEIDER) CUVIER, Règne Anim. [1re éd.], II, p. 252, 1817; 2e éd., II, p. 239, 1829, etc.; éd. illus., Poiss., p. 174.
<*Muræoides*, CLOQUET, Dict. Sc. Nat., XIX, p. 202, 1821.
<*Gunnellus*, FLEMING, Hist. Brit. An., p. 207, 1828.
<*Gunnellus*, CUVIER & VALENCIENNES, Hist. Nat. des Poiss., XI, p 418, 1836.
<*Günnellus*, KRÖYER, Naturhistorisk Tijdskrift, I, p. 376, 1837.
<*Ophisomus*, SWAINSON, Nat. Hist. Fishes, etc., II, pp. 183, 277, 1839.
= *Gunnellus*, GIRARD, Expl. and Surv. for R. R. Route to Pacific Oc., X, Fishes, p. 116, 1858.
<*Centronotus*, GÜNTHER, Cat. Fishes Brit. Mus., III, p. 285, 1861.
Blennius, sp., LINNÆUS, etc.

[1] *Ophisomus* = "*Gunnellus* Auct. 'Nomina generica quæ ex Græca vel Latina lingua radicem non habent, rejicienda sunt.' *Illiger, Prod.* xvii."—Swainson, Vol. II, 277.

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IX.

The substitution of the name *Pholis* entails a change of name for the including family, viz:

Family PHOLIDIDÆ.

Family Synonyms.

= *Xiphidiontidæ*, GILL, Canadian Naturalist (2), II, pp. 247, 253.
= *Xiphidiontidæ*, GILL, Arrangement Families Fishes, p. 4, 1872.
< *Gunnelli*, FITZINGER, Sitzungsber. k. Akad. der Wissensch. (Wien), LXVII, 1. Abth., p. 41, 1873.
< *Centroblennioidei*, BLEEKER, Versl. Med. k. Akad. Wet. Amsterdam (2), VIII, p. 368, 1874.
= *Pholididæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 136, 1892.
Gobioïdes, part, CUVIER ET VALENCIENNES.
Blenniidæ, part, GÜNTHER et al.

Subfamily Synonyms.

< *Monactylia*, RAFINESQUE, Analyse de la Nature, p. 82, 1815.
< *Gunnelliformes*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. XXV, 1859.
= *Ophisominæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, p. 183, 1839.
= *Centronotinæ*, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 146 (1859).
< *Gunnellini*, BLEEKER, Versl. Med. k. Akad. Wet. (2), VIII, p. 368, 1874.

X.

Under the name *Centronotus*, the third given after *Ophidion*, Dr. Günther, in 1861, included nine recognized and seven doubtful species, which belong to different genera, viz:

RECOGNIZED SPECIES.

1. *C. gunellus* ..... *Pholis gunnellus.*
2. *C. fasciatus* ..... *Pholis fasciatus.*
3. *C. nebulosus* ..... { *Pholis nebulosus.* / *Pholis ornatus.*
4. *C. apus* ..... *Asternopteryx apus.*
5. *C. gunelliformis* ..... *Asternopteryx gunnelliformis.*
6. *C. dolichogaster* ..... *Pholis dolichogaster.*
7. *C. alectrolophus* ..... *Anoplarchus alectrolophus.*
8. *C. crista galli* ..... *Anoplarchus atropurpureus.*
9. *C. roseus* ..... *Gunnellops roseus.*

DOUBTFUL SPECIES.

1. *Ophidium muronatum* M..... *Pholis gunnellus.*
2. *Blennius tænia* P..... *Pholis tænia.*
3. *Blennius ruberrimus* P..... *Pholis ruberrimus.*
4. *Blennius polyactocephalus*..... *Chirolophus polyactocephalus.*
5. *Gunellus crassispina* S..... *Pholis crassispina.*
6. *Gunellus macrocephalus* G..... *Pholis gunnellus.*
7. *Clinus affinis*..... *Stichæus affinis.*

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XI.

Under the name of *Gymnelis imberbis*, Dr. Günther[1] combined the following references, most of which relate to the *Pholis gunnellus:*

GYMNELIS IMBERBIS.

Gymnelis imberbis, KAUP, Ap. Fishes, p. 156; YARRELL, Brit. Fishes, ed. RICHARDSON, I, p. 79; GÜNTHER, Cat., IV, p. 325.

PHOLIS GUNNELLUS.

Ophidium imberbe, LINNÆUS; MONTAGUE, Wern. Mem., I, 95.—TURTON, Brit. Fauna, p. 88.—FLEMING, Brit. An., p. 201.—JENYNS, Man., p. 481.—YARRELL, Brit. Fishes, ed. 2, II, p. 412.

CARAPUS ACUS.

Ophidium imberbe, LACÉPÈDE, part. (Radial formula and caudal fin of *Pholis gunnellus.*)

ANGUILLA ANGUILLA.

Beardless *Ophidium*, PENNANT, Brit. Zool., III, 398, App., tab. 93.

The conglomerate nominal species retained by Dr. Günther under the name *Gymnelis imberbis* had obtained a place in British zoology since the early part of the century, and until I demonstrated in my article "On the affinities of several doubtful British fishes," published in 1864,[2] that it was simply the embodiment of blunders of one kind or another.

[1] Cat. Fish. Brit. Mus., IV, p. 325.

[2] Proc. Acad. Nat. Sci. Phila., 1864, pp. 199–208.

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THE DIFFERENTIAL CHARACTERS OF THE SYNGNATHID AND HIPPOCAMPID FISHES.

By THEODORE GILL, LL. D.

THE TYPICAL Lophobranchs have been distributed among two families by several authors, but by most have been combined in one. The reasons generally given for the separation have not been very satisfactory, and I now propose to indicate those which have influenced me.

I.

The first to recognize the family difference between the groups in question, and to give appropriate names to them, was Prof. Giovanni D. Nardo.

In 1842 (1844)[1] Professor Nardo divided the Lophobranchs into two families, Syngnathidæ and Hippocampidæ, in the following terms:

Fam. 1. *Syngnathidæ* NARDO. Annuli protovertebrales constituuntur scutis squamoso-corneis, medio angulosis, symmetrice striatis, contiguis, subimbricatis, corio superpositis, adhærentissimis. Ossa nasalia et palatina usque ad apicem rostri protracta, et maxillæ superiori conjuncta. Epidermis crassa, stipata, continua, adhærens, scutorum strias exhibens. Appendices cutaneæ nullæ.

Subfamilia 1. *Syngnathini* NARDO. Ventrales nullæ; os terminale; apertura branchiarum ad nucham.

Subfamilia 2. *Scyphini* NARDO.[2] Corpus pinna unica seu dorsali instructum est.

Fam. 2. *Hippocampidæ* NARDO. Annuli protovertebrales constituuntur ossiculis quadrangularibus, angulis porrectis, centro in tuberculum salientibus, distantes, et sibi invicem per angulos tantum seriatim et symmetrice conjunctis, corio intrinsecus obsitis. Ossa nasalia et palatina ad medium tantum rostri protracta, et maxillæ superiori contigua. Epidermis continua, adhærentissima, glabra. Appendices cutanæ multæ, etc.

Subfamilia 1. *Hippocampini* NARDO. Ventrales et caudales nullæ; os terminale; apertura branchiarum ad nucham ec.

Subfamilia 2. *Pegasini* NARDO. Ventrales filiformes; os inferum ad basin rostri; apertura branchiarum ante pinnas pectorales, etc.

Subfamilia 3. *Solenostomini* NARDO. Ventrales grandes, pectoralibus conjunctæ; os terminale; apertura branchiarum ad jugulum ec.

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[1] Considerazione sopre alcune nuove famiglie de' Syngnathi e de' Plectognathi, e sui caratteri anatomici che le distinguono. <Atti Scienz. Ital., 1843, pp. 244, 245.

[2] *Syngnathini*, BONAPARTE, Catal. Metod. Pesci Europei, pp. 9, 89, 1846, is apparently coequal with *Scyphini* of Nardo.

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In 1846 Prince Bonaparte (of Canino) adopted this classification, but changed the name from *Hippocampidæ* to *Pegasidæ*, and substituted for *Syngnathini*, *Siphostomini*, and for *Scyphini*, *Syngnathini*. The former change was effected doubtless for the reason that *Pegasus* was the longest named genus, and the latter because *Syngnathus* was restricted to the genus called *Nerophis* by other authors, while the one generally called *Syngnathus* was designated after Rafinesque *Siphostoma*. Bonaparte's arrangement, then, was as follows:

Osteodermi [= *Lophobranchii*].
  Pegasidæ [= *Hippocampidæ* N.].
    Solenostomini.
    Pegasini.
    Hippocampini.
  Syngnathidæ.
    Siphostomini [= *Syngnathini* N.].
    Syngnathini [= *Scyphini* N.].

The relationship between the *Hippocampini* and the restricted Syngnathidæ is evidently far nearer than that between the former and the *Solenostomini* and *Pegasini*. Inasmuch as the last two types are now universally conceded to be of family rank, it is unnecessary to urge the differences between them and the *Hippocampini*. The characters used to combine the three by Nardo are, indeed, not only superficial, but illusive. There are, however, differences in dermal investment between the Syngnathidæ proper and Hippocampini (or Hippocampidæ) which may be appreciated on analysis, and which are indicated in the diagnoses of the respective families submitted in the following synopsis.

Swainson referred three Linnæan genera to his family Syngnathidæ, which he divided into subgenera as follows:

Pegasus, LINN. [= *Pegasidæ*, AD.].
Hippocampus, LINN. [! = *Hippocampidæ*, AD.].
  [*Hippocampus* restricted.]
  Phyllopteryx, SW.
  Solenostoma, LAC.
Syngnathus, LINN. [= *Syngnathidæ*, AD.].
  Syngnathus, LINN.
  Acus, WILL.
  Solegnathus, SW.

It is probable that Adams, if he had proceeded independently, would not have been guilty of the gross inconsistencies which Swainson perpetrated, but, as a matter of fact, his diagnoses were almost interchangeable with those assigned to the corresponding groups by Swainson.

In 1854 Adams recognized three families of Lophobranchii and diagnosed the Syngnathidæ and Hippocampidæ as follows:

1. FAMILY.—*Pipefishes* (Syngnathidæ).—Body prolonged, slender, or angulated; snout greatly prolonged, cylindrical; mouth terminal, vertical; ventral fins absent; caudal fin wanting in some.

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2. FAMILY.—*Sea-horses* (Hippocampidæ).—Head and body compressed; snout narrow, tubular; mouth terminal; pectorals small, dorsal single; caudal fin wanting.

3. FAMILY.—*Winged Sea-horses* (Pegasidæ).

Mr. Adams' work was largely based on Swainson's, and his diagnoses of families were often essentially similar to many of Swainson's.

In 1858 Dr. Girard adopted the families Hippocampidæ (after Owen and Baird) and Syngnathidæ, with the following data:

Family HIPPOCAMPIDÆ, Owen.

The sea-horse family being composed, to our knowledge, of but one genus (*Hippocampus*), we will not enlarge upon its characters here, since alluding to them would be a mere repetition of their enumeration further on.

He added that—

The position these fishes assume in the media in which they live is not the least of their peculiarities entitling them to the rank of a family in the ichthyic method.

Family SYNGNATHIDÆ, Bonaparte.

The same remark consigned under the head of Hippocampidæ applies again to this family, for the genus *Syngnathus* is the sole generic type which we have had an opportunity of examining. Those established by Kaup are quite numerous, but the description of their characters has not yet come into our hands.

The characters thus connected indirectly with the families in question are simply of generic value, and the agreement in many characters of *Hippocampus* with *Gasterotokeus*, *Solenognathus* and *Phyllopteryx*, associated with it by Kaup, shows that the "position these fishes assume" is of minor value and not significant of family differentiation. As Girard had knowledge of Kaup's article published in 1853,[1] he had data to forbid the assumptions he indulged in.

In 1882 Jordan and Gilbert accepted the two families in question and briefly differentiated them as follows:

"E. Snout tubular, bearing the short, toothless mouth at its end; body mailed.
"F. Caudal fin present; head in the line of the axis of the body..*Syngnathidæ*.
"FF. Caudal fin wanting; head not in line of axis of body...*Hippocampidæ*."

In the descriptive portion of their synopsis they gave amplified descriptions of the families, but did not add to their differential characters.

II.

It will be obvious to anyone who compares the definitions above given with a collection of the fishes for which they were framed, that they are not applicable to any natural groups, and that such natural groups are definable by characters that have been generally neglected. I am therefore led to submit diagnoses of the several groups which appear to me to be at least better than those for which they are

[1] Uebersicht der Lophobranchier. <Archiv Naturg., 1853, I, 226–234.

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substituted. I do not anticipate, however, that they will be found to be definitive of the most natural arrangement, but the labor of years and a close and rigorous comparison of the skeletons of many genera will be requisite before such perfection is attainable. Meanwhile the notes here presented may be of some use in directing attention to features hitherto observed and as tentative to future work.

Some erroneous conceptions have been entertained and misstatements made respecting features of the pipefish's structure. Only a few need be here noticed, however. Such are the statements that the preoperculum and interoperculum are wanting, that the intermaxillaries are also absent, and that the symplectic is a very important element. The preoperculum and interoperculum, as well as intermaxillaries, are developed, but I am unable to identify the symplectic. In no respect do the Lophobranchs deviate so materially from ordinary fishes as has been supposed. But, as long ago shown by Parker, they manifest, in addition to the peculiarities generally noticed, deviations in the scapular arch. There is no posterotemporal, the posttemporal and proscapula being immediately connected, and the "coraco-scapular plate" is entire and not broken up into hypercoracoid and hypocoracoid bones.

III.

Order LOPHOBRANCHII.

Synonyms as Order.

<*Lophobranches*, CUVIER, Règne Animal, 1e éd., II, p. 155, 1817.

<*Osteodermi*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39), 1832; Nuovi Annali delle Sci. Nat., II, p. 130, 1838; IV, p. 185, 1840.[1]

<*Bursipari vel Incubatores*, NARDO, Atti Congressi Scienze Ital. rac. et ord., I, p. 70, 1842 (1844).

<*Lophobranchii*, GIRARD, Expl. and Surv. for R. R. Route to Pacific Oc., X, Fishes, p. 78, 1858.

>*Solenostomi*, BLEEKER, Enum. Sp. Pisc. Archip. Ind., p. xiv, 1859.[2]

>*Syngnathi*, BLEEKER, Enum. Sp. Pisc. Archip. Ind., p. xv, 1859.

=*Prostomides*, DUMÉRIL, Hist. Nat. Poiss., II, p. 495, 1870.

=*Lophobranchii*, GÜNTHER, Cat. Fishes Brit. Mus., VIII, pp. 150, 186, 1870.

=*Lophobranchii*, COPE, Proc. Am. Assoc. Adv. Sci., XX, p. 330, 1872.

=*Lophobranchii*, FITZINGER, Sitzungsber. k. Akad. der Wissensch., Wien, LXVII, 1. Abth., p. 49, 1873.

Synonym as Subclass.

Lophobranches, DUMÉRIL, Hist. Nat. Poiss., II, pp. 473, 488, 1870 (sous-classe).

Suborder SYNGNATHI.

Synonym as Order.

=*Syngnathi*, BLEEKER, Enum. Sp. Pisc. Archip. Ind., p. xv, 1859.

[1] The "Sectio 2. Lophobranchii (Syngnathi)" of Bonaparte (op. cit.) is coequal with the "Ordo III. Osteodermi."

[2] The "series Hyperostomi" of the "sublegio Lophobranchii seu Dactylodermi," *Bleeker*, Enum. Sp. Pisc. Arc. Ind., p. xiv, 1859, is coequal with the order Lophobranchii as here accepted.

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Synonym as Suborder.

=*Syngnathi*, GILL, Arrangement Families Fishes, p. 2, 1872.

Family SYNGNATHIDÆ.

Synonymy.

<*Signatidi*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 36, 1810.
<*Syngnathidæ*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39), 1832.
<*Syngnathidæ*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 130, 1838; IV, p. 185, 1840.
<*Syngnathidæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 195, 331, 1839.
=*Syngnathidæ*, NARDO, Atti Congressi Scienz. Ital. rac. et ord., I, p. 70, (1842) 1844.
<*Syngnathidæ*, KAUP, Archiv für Naturg., 19. Jahrg., I, p. 228, 1853; also Cat. Lophobr. Fishes Brit. Mus., p. 5, 1856.
<*Syngnathidæ*, GIRARD, Expl. and Surv. for R. R. Route to Pacific Oc., X, p. 343, 1858.
<*Syngnathoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xv, 1859.
<*Syngnathidæ*, DUMÉRIL, Hist. Nat. Poiss., II, p. 499, 1870.
<*Syngnathidæ*, GÜNTHER, Cat. Fishes Brit. Mus., VIII, p. 153, 1870.
=*Syngnathidæ*, COPE, Proc. Am. Assoc. Adv. Sci., XX, p. 339, 1872.
=*Syngnathidæ*, GILL, Arr. Fam. Fishes, p. 2, 1872.
=*Syngnathi*, FITZINGER, Sitzungsber. k. Akad. der Wissensch. (Wien), LXVII, 1. Abth., p. 49, 1873.
<*Syngnathidæ*, MOREAU, Hist. Nat. Poiss. France, II, p. 28, 1881.
=*Syngnathidæ*, JORDAN and GILBERT, Syn. Fishes N. Am., pp. 80, 382, 1882.

Syngnathi with squarish quadrangular plates attingent by extensive margins to the anterior and posterior plates, and allowing more or less lateral movements; tail not prehensile or curved downward.

Subfamily SIPHOSTOMINÆ.

Synonymy.

<*Syngnathini*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39), 1832.
<*Syngnathini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 130, 1838; IV, p. 186, 1840.
<*Syngnathini*, NARDO, Atti Sc. Ital. 1843, p. 244; Atti Congressi Scienz. Ital. rac. et ord., I, 1842, p. 70 (1844).
<*Siphostomini*, BONAPARTE, Catal. Metod. Pesci Europei, pp. 9, 89, 1846.
=*Syngnathinæ*, KAUP, Archiv für Naturg., 19. Jahrg., I, p. 231, 1853; also Cat. Lophobr. Fishes Brit. Mus., p. 21, 1856.
=*Syngnathiformes syngnathini*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xv, 1859.
=*Syngnathini*, DUMÉRIL, Hist. Nat. Poiss., II, pp. 499, 534, 1870.
<*Syngnathina*, GÜNTHER, Cat. Fishes Brit. Mus., VIII, pp. 153, 154, 1870.
=*Syngnathini*, MOREAU, Hist. Nat. Poiss. France, II, p. 40, 1881.

Syngnathidæ with pectoral fins, a long cleft subcaudal ovigerous pouch to males, and the upper caudal ridge continuous with the lateral and the lower caudal ridge with the ventrolateral ridge of the trunk.

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Subfamily DORYRHAMPHINÆ.

Doryrhamphinæ, KAUP, Archiv Naturgesch., 19. Jahrg., I, p. 233, 1853; Cat. Loph. Fish. Brit. Mus., p. 54, 1856.
Doryrhamphini, DUMÉRIL, Hist. Nat. Poiss., II, pp. 499, 585, 1870.

Syngnathidæ with pectoral fins and with a pectoral or abdominal ovigerous pouch to the males.

Subfamily SYNGNATHINÆ.

=*Scyphini*, NARDO, Atti Sc. Ital., 1843, p. 244.
=*Syngnathini*, BONAPARTE, Cat. Met. Pesci Eur., pp. 9, 90, 1846.
=*Nerophinæ*, KAUP, Archiv Naturgesch., 19. Jahrg., I, p. 234, 1853.
=*Nerophini*, DUMÉRIL, Hist. Nat. Poiss., II, pp. 499, 600, 1870.
=*Nerophini*, MOREAU, Hist. Nat. Poiss. France, II, p. 61, 1881.

Syngnathidæ without pectoral fins or an ovigerous pouch, the eggs being attached to the belly of the male, and the upper caudal ridge continuous with the dorso-lateral and the lower caudal ridge with the lateral ridge of the trunk.

Subfamily GASTROTOKEINÆ.

Syngnathidæ with pectoral fins, no ovigerous pouch but eggs embedded in a soft membrane of the abdomen in the males; the upper caudal ridge continuous with the dorso-lateral, and the lower caudal ridge continuous with the ventro-lateral ridge; the body expanded below in a horizontal surface between the lateral lines, and the tail tapering and finless.

Family HIPPOCAMPIDÆ.

Synonyms as families.

<*Hippocampidæ*, NARDO, Atti Congressi Scienze Ital. rac. et ord., I, 1842, p. 70, (1844).
<*Pegasidæ*, BONAPARTE, Cat. Met. Pesci Eur., p. 9, 1846.
>*Hippocampidæ*, OWEN, Lect. Comp. Anat. Vert. An., I, p. 50, 1846.
>*Hippocampidæ*, BAIRD, Icon. Encycl., II, p. 232, 1850.
>*Hippocampidæ*, ADAMS, Man. Nat. Hist., p. 94, 1854.
>*Hippocampidæ*, GIRARD, Expl. and Surv. for R. R. Route to Pacific Oc., X, Fishes, p. 342, 1858. (Incl. *Hippocampus* only.)
=*Hippocampidæ*, COPE, Proc. Am. Assoc. Adv. Sci., XX, p. 339, 1872.
=*Hippocampidæ*, GILL, Arr. Fam. Fishes, p. 2, 1872.
=*Hippocampi*, FITZINGER, Sitzungsber. k. Akad. der Wissensch. Wien, LXVII, 1. Abth., p. 49, 1873.
=*Hippocampidæ*, JORDAN and GILBERT, Syn. Fishes N. Am., pp. 80, 385, 1882.
=*Hippocampidi*, POEY, Repert. Hist. Nat. Cuba, II.

Syngnathi with rhombiform quadrangular, or irregular plates with extensions buttressed against corresponding ones of the preceding and succeeding plates, thus prohibiting any lateral movement; tail more or less prehensile or curved downward; proscapular plates large and mammilated, and antepectoral plate wide.

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Subfamily SOLEGNATHINÆ.

Synonyms.

<*Solegnathinæ*, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 149 (1859).
=*Solegnathinæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 137, 1893.

Hippocampidæ with the upper caudal ridge deflected and continuous into the lateral ridge and the lower caudal ridge continuous with the ventro-lateral ridge of the trunk; nuchal plate not elevated and not connate with the head.

Only one genus is known, viz:

Solegnathus, SWAINSON, 1839.

Subfamily HIPPOCAMPINÆ.

Synonyms as subfamilies.

<*Hippocampini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 130, 1838; IV, p. 186, 1840.
<*Hippocampini*, NARDO, Atti Congressi Scienz. Ital. rac. et ord., I, 1842, p. 70, (1844).
<*Hippocampinæ*, KAUP, Archiv für Naturg., 19. Jahrg., I, p. 228, 1853; also Cat. Lophobr. Fishes Brit. Mus., p. 6, 1856.
<*Hippocampiformes*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xv, 1859.
=*Hippocampinæ*, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 149 (1859).
<*Hippocampini*, DUMÉRIL, Hist. Nat. Poiss., II, pp. 499, 500, 1870.
<*Hippocampina*, GÜNTHER, Cat. Fishes Brit. Mus., VIII, pp. 153, 194, 1870.
=*Hippocampini*, MOREAU, Hist. Nat. Poiss. France, II, p. 34, 1881.

Hippocampidæ with the upper caudal ridge ceasing forward under the dorsal and the lower caudal ridge continuous with the lateral ridge of the trunk; nuchal plate more or less elevated, crowning the back of the head and connate with the preceding plate.

The subfamily thus defined includes five genera, which represent two sections which themselves should perhaps be raised to subfamily rank.

Section 1.

Hippocampus, RAFINESQUE, 1810.
Acentronura, KAUP, 1853.

Section 2.

Phyllopteryx, SWAINSON, 1839.
Phycodurus, GILL, 1895.
Haliichthys, GRAY.

The genus *Phyllopteryx*, as left by Dr. Günther, embraces three species, each of which appears to represent a distinct genus, one of which is unnamed. This is represented by the *P. eques* of Günther and may be termed *Phycodurus* on account of its tail, which seems to branch out like a seaweed (φυκωδες); it is distinguished further by the alternate contraction and expansion of the inferior contour of the body, the spinigerous inferior ridge and the low-set dorsal fin.

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NOTES ON THE SYNONYMY OF THE TORPEDINIDÆ OR NARCOBATIDÆ.

By THEODORE GILL, LL. D.

SEVERAL genera of the family Torpedinidæ have for many years been known under names which are of later date than those under which they were first made known. The typical genus of the family, too, has for almost a century enjoyed a name (partly a heritage from the ancients) which by right belongs to another very distant genus of true fishes. To demonstrate these facts is the object of the present communication.

I.

For more than twenty years I have been aware of a use of the word *Torpedo* which would necessitate some violent changes if the rules of nomenclature were strictly followed. But as most ichthyologists until lately have been unwilling to follow such rules, if they interfered with their preconceived ideas, I have reserved the information in question in order to avoid inflicting too severe a shock, and have hoped that some other might have discovered the facts. No one has yet announced the discovery, however, and as there are now many ichthyologists who are amenable to rules and are willing to accept evidence, I have deemed a historical exposition of certain facts timely and no longer premature.

In 1775 Forskål's "Descriptiones Animalium, Avium, Amphibiorum, Piscium, Insectorum, Vermium," etc., was published, and in it is a description of what is called *Raja torpedo*. The so-called *Raja* was distinguished by "pinna dorsali adiposa, corpore nigro maculato, cirrhis oris sex," and was described at length. The description is applicable to the "electric catfish" of the Nile. In a note, the species is referred to a distinct genus in the following terms, and with the distinctions of typography here used:

OBS. 1.[1] An cum *Mormyro* genere potest sociari; vel inter Torpedines posteriores Rondeletii locum invenire: aut potius novum constituere genus? Certe determinatur Torpedinis CHARACTER GENERICUS: *Piscis branchiostegus: apertura lineari, obliqua supra pinnas pectorales: corpore nudo: pinnis ventralibus, seu abdominalibus: dentibus numerosissimis, densis, subulatis.*

[1] The second note ("Obs. 2") refers to the habits, electrical properties, use, etc., of the species.

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Every requisite for generic nomenclature is here fulfilled. A name is given, a real diagnosis is supplied, and a typical species described. Of course a great mistake was made in identification, but the description and not the identification is the cardinal point in the determination of the question at issue. The perversion of the name *Torpedo* from the rays so long familiar under that designation is very regrettable and at variance with ancient usage; but even the ancient use of *Torpedo* for the rays was secondary, the primary use being for the quality of numbness or torpidity, and the electric catfish is as much the embodiment of numbness as the electric ray. Besides, we have been too much used to wanton perversions of old names to be much shocked by any new manifestation. Witness the perversion of the name *Trochilus* (originally used for a snipe) to the exclusively American humming birds, and of *Amia* (originally given to a tunny) to the equally American ganoids. For such unscientific perversions we have to blame Linnæus and his followers, and so distorted were their views of the fitness of things that they even took a certain pride in misusing such names, and were very particular in rejecting what they were pleased to call barbarous and nonclassical terms. Remonstrances against such perversions were not wanting to Linnæus, even very early in his career;[1] but he was deaf to all, and scientific nomenclature has consequently been cursed with a load of names revived in a very different sense from their primitive use. At worst, one more such misused term will be *Torpedo*, but its misuse will be less repulsive than that of many others, because its primary meaning will not be in disaccord with the fish.

The facts in question are thus exhibited in the synonymy:

Genus TORPEDO.

=*Torpedo*, FORSKÅL, Desc. Anim., etc., p. 16, 1775.
=*Malapterurus*, LACÉPÈDE, Hist. Nat. Poiss., V, p. 90, 1802.
=*Anacanthus*, MINDING, Lehrb. Nat. Fische, p. 117, 1832.
Raja sp., FORSKÅL.
Silurus sp., GMELIN et al.

The family to which it belongs should consequently be called TORPEDINIDÆ.

II.

If the propriety of the retention of the name *Torpedo* in place of *Malapterurus* is conceded, it necessarily follows that another name must be used for the genus of electric rays. *Narcacion* is the oldest term, having been given by Klein in 1742, and was adopted in 1861 by Gill and later by Bleeker, but having been given before the establishment of the binomial system of nomenclature is now considered ineligible.

[1] Dillenius, in an early letter to Linnæus, remarked: "I do not object to Greek words, especially in compound names; but I think the names of the ancients ought not rashly and promiscuously to be transferred to our new genera, or those of the New World." There was much more sound advice in the letter, which Linnæus unfortunately did not profit by.

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The next in order of proposition is *Narcobatus*, introduced by De Blainville in 1816, and this should accordingly be adopted.

III.

In 1862, in a note on the classification of the "Torpedinoidæ" or "Narcaciontoidæ," I proposed a new generic name for the Torpedininæ, or "Narcaciontinæ" without dentiform processes round the spiracles, in the following terms:

Spiracles with dentated borders ..... *Narcacion.*
Spiracles with smooth borders (*Torpedo occidentalis* St.) ..... *Tetronarce.*

Tetronarce should of course have been *Tetranarce*, the name alluding to the four-sided form. *Tetronarce* was purely a printer's blunder.

In 1886 Dr. G. Fritsch, in a communication on the systematic arrangement of the species of *Torpedo*,[1] proposed the same subdivision as the preceding, calling the *Narcacion* of Gill *Fimbriotorpedo*, and the *Tetranarce* of Gill *Gymnotorpedo*.

IV.

In 1826 Dr. J. J. Kaup[2] proposed a new genus named *Narke* for the *Raja capensis* of Gmelin, which he defined in the following terms:

Narke. Raja GMEL. *Torpedo* Schneid. Kennz. der Gattung. Scheibe des Körpers rund. Rücken gewölbt. Spritzlöcher, die kurzen Röhren hinter den Augen. Schwanz fleischig, kurz, mit einer Rückenflosse.

Diese Gattung ist nahe mit Torpedo verwandt, von welcher sie der gewölbte Rücken und der Mangel der einen Schwanzrückenflosse unterscheidet. Eine Art. Raja Gronoviana, Lacèp. Raja capensis, Gmel.

As the generic name *Narke* was published more than a decade before *Astrape* and was well defined, the former name (not having been previously used) must be revived.

V.

The genera of Narcobatids were segregated by me in 1862 into three subfamilies. These are well distinguished by skeletal and visceral characters, as well as external ones, and are here retained. *Discopyge* may represent a fourth subfamily distinguished by the united ventrals. The essential synonyms of the respective subfamilies and genera are also given.

Family NARCOBATIDÆ.

Torpedines, HENLE, Über Narcine, p. 29, 1834.
Torpedines, MÜLLER, Mag. Nat. Hist., n. s., II, p. 90, 1838.
Torpedines, MÜLLER and HENLE, Syst. Beschreib. Plagiostomen, p. 126, 1841.
Torpedinidæ, OWEN, Lect. Comp. Anat. Vertbr. An., I, p. 51, 1846.
Torpedinidæ, ADAMS, Man. Nat. Hist., p. 87, 1854.
Torpedinidæ, RICHARDSON, Encycl. Brit., 8. ed., XII, p. 328, 1856.

[1] Arch. Anat. Phys., 365.
[2] "Beiträge zur Amphibiologie und Ichthyologie" (Isis, 1826, col. 87-90).

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Torpedinoidei, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xiii, 1859.
Torpedinoidæ, GILL, Cat. Fishes E. Coast N. America, p. 61, 1860.
Torpedinoidæ or *Narcaciontoidæ*, GILL, Annals Lyc. Nat. Hist. New York, VIII, p. 386, 1861.
Torpedines, DUMÉRIL, Hist. Nat. Poiss., I, p. 503, 1865.
Torpedinidæ, GÜNTHER, Cat. Fishes Brit. Mus., VIII, pp. 434, 448, 1870.
Torpedines, FITZINGER, Sitzungsber. k. Akad. der Wissensch., Wien, LXVII, 1. Abth., p. 57, 1873.

Subfamily NARCOBATINÆ.

>*Torpedinini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 130, 1838; IV, p. 183, 1840.
>*Torpedinæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 192, 321, 1839.
>*Torpedinina*, GRAY, List. Fish. Brit. Mus., I, p. 99, 1851.
=*Torpedininæ*, GILL, Cat. Fishes E. Coast N. America, p. 63, 1861.
=*Narcaciontinæ*, GILL, Annals Lyc. Nat. Hist. New York, VIII, p. 387, 1861.

Genus NARCOBATUS.

>*Narcacion*, KLEIN, Historiæ Piscium Promovendæ missus tertius de Piscibus per branchias occultas spirantibus, p. 31, 1742.
>*Torpedo*, DUMÉRIL, Zoologie Analytique, p. 102, 1806.
>*Narcobatus*, BLAINVILLE, Journal de Physique, etc., LXXXIII, p. 263, 1816; Bull. Soc. Philom., 1816, p. 121.
>*Torpedo*, MÜLLER and HENLE, Syst. Beschreib. der Plagiostomen, p. 126, 1844.
>*Narcacion*, GILL, Proc. Acad. Nat. Sci. Phila., 1861, App. (Cat. Fishes E. Coast N. America), p. 63, 1861.
=*Narcacion*, GILL, Annals Lyc. Nat. Hist. New York, VIII, p. 386, 1861.
>*Torpedo*, GÜNTHER, Cat. Fishes Brit. Mus., VIII, p. 448, 1870.
=*Fimbriotorpedo*, FRITSCH, Archiv. Anat. Phys., p. 365, 1886.

Genus TETRANARCE.

=*Tetronarce*, GILL, Annals Lyc. Nat. Hist. New York, VII, p. 386, 1861.
=*Gymnotorpedo*, FRITSCH, Archiv. Anat. Phys., 365, 1886.
Torpedo sp., AUCT.
Narcine sp., GIRARD.
Narcacion sp., GILL.

Subfamily NARCININÆ.

=*Narcininæ*, GILL, Ann. Lyc. Nat. Hist. New York, VIII, p. 387, 1861.

Genus NARCINE.

=*Narcine*, HENLE, Über Narcine, p. 31, 1834.
>*Syrraxis* (JOURDAN), BONAPARTE, Fauna Ital. sub Torpedo narce.
=*Narcine*, MÜLLER and HENLE, Archiv Naturgesch. 1837, I, p. 400; Syst. Beschreib. Plagiostomen, p. 129, 1841.
>*Narcine*, GILL, Ann. Lyc. Nat. Hist. New York, VIII, p. 387, 1861.
>*Cyclonarce*, GILL, Ann. Lyc. Nat. Hist. New York, VIII, p. 387, 1861.
>*Gonionarce*, GILL, Ann. Lyc. Nat. Hist. New York, VIII, p. 387, 1861.

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Genus NARKE.

=*Narke*, KAUP, Isis, XVIII, p. 88, 1826.

=*Astrape*, MÜLLER and HENLE, Archiv Naturgesch., 1837, I, p. 400. ("*T. capensis* und *T. dipterygia* aut." named only.)

Genus TEMERA.

=*Temera*, GRAY, Zool. Miscel., p. 7, 1831.

Subfamily DISCOPYGINÆ.

Genus DISCOPYGE.

=*Discopyge*, TSCHUDI, Unters. Fauna Peruana, Ich., p. 32, 1845.

Subfamily HYPNINÆ.

=*Hypninæ*, GILL, Ann. Lyc. Nat. Hist. New York, VIII, p. 386, 1861.

Genus HYPNOS.

=*Hypnos*, A. DUMÉRIL, Rev. et Mag. Zool. (2), IV, p. 277, 1852.

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THE FAMILIES OF SYNENTOGNATHOUS FISHES AND THEIR NOMENCLATURE.

By THEODORE GILL, LL. D.

IN 1872 I recognized two families of Synentognathous fishes and designated them as Belonidæ and Scomberesocidæ, establishing the former for Belone as generally understood,[1] and restricting the latter to the Exocœtine, Hemirhamphine and Scomberesocine types.[2]

The constituents were thus indicated, but the families themselves were not defined. To complete this delayed task, as well as to present the opinion of others, is the object of the present communication.

I.

The genus *Esox* was adopted by Linnæus from Artedi, and its cardinal character was the backward position of the dorsal and anal fins, and their opposition to each other. The other points noted were secondary and sometimes ignored in practice. The artificial character of the genus will be evident from a consideration of the species referred to it in the last edition of the Systema Naturæ.[3]

Species of the Linnæan genus Esox.

Linnæan species.	Modern genera to which referred.
1. *Sphyræna*	*Sphyræna.*
2. *osseus*	*Lepisosteus.*
3. *Vulpes*	*Albula.*
4. *Synodus*	*Synodus.*
5. *Lucius*	*Lucius* (= *Esox*, Cuvier).
6. *Belone*	*Esox* (= *Belone*, Cuvier).
7. *Hepsetus**	
8 *brasiliensis*	*Hemirhamphus.*
9 *gymnocephalus*†	*Chirocentrus?*

*The *Esox hepsetus* of Linnæus was a compound of very dissimilar forms. In the tenth edition of the Systema Naturæ its synonyms are (1) the "Argentina pinna dorsali pinnæ ani opposita" of the Amœnitates Academicæ (I, p. 321, 1749), and (2) the Piquitinga of Marcgrave. The former is unrecognizable, but Cuvier and Valenciennes felt sure that it was not a *Hemirhamphus*. It had numerous teeth (os interne denticulis exasperatum), the lower jaw slightest produced (maxilla inferior paullo longior), a double lateral line (duplici linea longitudinali a lateribus distinctum), and the rays: B. approximately 10 (cerciter decem), D. 14, P. 12, V. 6, A. 15, C. 14.

†The *Esox gymnocephalus* is another of the undeterminable species of Linnæus. Cuvier and Valenciennes thought that it might have been an *Erythrinus*, but such could not have been the case, as the radial formula (D. 13, P. 10, V. 7, A. 26, C. 19) clearly shows, even assuming that Linnæus had erred as to its habitat ("in India"). It essentially agrees with the *Chirocentrus dentex*, and was quite likely a young specimen of that species ("Magnitudine *Ammodytis* erat qui nobis visus").

[1] Günther, Cat. Fish. Brit. Mus., VI, pp. 234–256.

[2] Günther, op. cit., pp. 256–298. [3] Vol. I, pp. 515–517.

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This strange medley (rendered more heterogeneous still by some succeeding authors) was allowed to remain for a number of years. At length, in or before 1803, *Sphyræna*, *Lepisosteus*, *Albula* and *Synodus* were eliminated, but not until 1810 was the residuum disintegrated.

II.

In 1810 Rafinesque, in his "Caratteri," divided the genus *Esox* as left by Lacépède in the following terms:

Il genere Esox di Linneo è stato diviso da Lacépède in quattro generi, *Esox*, *Sphyræna*, *Synodus* e *Lepisosteus;* io propongo di dividere nouvamente in due il suo genere *Esox;* lascierò questo nome alle specie marine che hanno il corpo tetragono con due linee laterali da ogni lato como nil genere *Exocœtus*, le mascelle lunghe e strette, le ale dorsale lunghe giungendo dall' ano fino alla coda e falciformi, &c.; mentre formerò un nuovo genere col nome di *Lucius* della specie fluviatile che hanno il corpo cilindrico, una sola linea laterale, le mascelle larghe, e le ale dorsali ed anali corte e rotondato.

This division was quite good, and the distinction of the two genera justified by the contrasted characters as well as the names. Rafinesque has still further the merit of recognizing a similarity between *Esox* as limited by him (*Belone*) and *Exocœtus*. But the proposition thus regularly formulated was destined to remain long in abeyance and the names given to be superseded by a later set.

III.

In 1817 Cuvier, in the "Règne Animal," divided *Esox* on the same lines as Rafinesque had done, but restricted *Esox*[1] to the pikes (*Lucius*, Rafinesque) and gave the name *Belone*[2] to the garfishes (*Esox*, Rafinesque). This view has been almost universally accepted, the only dissenters being Bonaparte in 1850, and very recently Jordan, with a few other American naturalists.[3] The reversion of those naturalists to the Rafinesquian names is perfectly justified. Even the perversion of ancient names is less under such usage than under the Cuvieran nomenclature. As this statement may surprise some, a justification of it is timely, especially as it may tend to quiet those whose minds would be otherwise too much disturbed.

IV.

Esox is a name so long connected with the pike in scientific nomenclature, that it is probable that even many ichthyologists suppose it to be the ancient name of that fish. There is, however, no reason to suppose that it was its proper name; on the contrary, there is every reason to believe it had nothing to do with the pike. The only occurrence of the word *Esox* (or *Isox*) or *Esos* in ancient classical literature, so far as

[1] Règne Animal, II, p. 183.

[2] Règne Animal, II, p. 185.

[3] Bleeker has revived the name *Mastacembelus* of Klein for the garfishes.

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preserved or known, is in a single passage of Pliny's Natural History[1]. According to Pliny, the *Esox* or *Esos* was a very large fish of the Rhine, equaling the tunny in size, that is, weighing about 1,200 pounds, and which might require a yoke of oxen to haul it out.[2]

Gesner imagined this notice to be referable to the pike, and he appears to have been the originator of the misconception, which, however, was not shared by his contemporaries or many of his successors. There is, indeed, good ground to believe that the name used by Pliny was a corruption of some German or Gallic designation of the sturgeon.

V.

Belone is generally connected with the gars, and by later lexicographers, as Liddell, Scott, and Drisler (1883), defined as "a sharp-nosed kind of fish, garfish, elsewhere *βαφίς*." This is, however, at most only partially true. The notices of Aristotle clearly indicate that in most cases a syngnathid or pipefish was the form intended; such as the statements that the belone, in the period of reproduction, splits apart and thus allows the eggs to escape, having a slit under the stomach and intestine which, when the eggs are discharged, heals up (VI, 11, 2);[3] and also that the belone is late in parturition and then burst, and that the young attach themselves to the parent (Aristotle, VI, 16, 4). The statement that the kingfisher's nest is principally composed of backbones of the belone[4] is also significant.

The point in the statement that the halcyon makes its nest of the belone's bones relates to the size of the fish. The gar is a comparatively large fish, and not likely to have been used in such connection. Nor is it obvious how the bones were identified as the belone's,[5] and it is probable that the allegation involves a generalization based on an extremely limited number of observations of nests in which dried pipefishes or their exoskeletons may have been found. It should not be forgotten, either, that the kingfisher scarcely makes a nest deliberately of fish bones. According to Seebohm,[6]

> The kingfisher does not make any more nest than that which the ejected fish bones supply. * * * Upon this nest of fish bones, if nest it can be properly called, the

[1] Book IX, chap. 17 (15).

[2] Præcipua magnitudine thynni: invenimus talenta XV pependisse. Ejusdem caudæ latitudinem duo [quinque] cubita et palmum. Sunt et in quibusdam amnibus haud minores: Silurus in Nilo; Esox in Rheno; Attilus in Pado, inertia pinguescens, ad mille aliquando libras, catenato captus hamo, nec nisi bovum jugis extractus. (Pliny, IX, cap. 17 (15).)

[3] Οἱ μὲν οὖν ἄλλοι ἰχθύες γόνῳ τίκτουσί καὶ τὰ ᾠὰ ἀφιᾶσιν ἡν δὲ καλοῦσί τινες βελόνην, ὅταν ᾖδη ὥρα ἡ τοῦ τίκτειν, διαῤῥῆγνυται, καὶ οὕτω τα ᾠα εξέρχεται· ἔχει γάρ τινα ὁ ιχθὺς ουτος διαφυσιν ὑπὸ τὴν γαστερα καὶ τὸ ἦτρον, ὥσπερ οἱ τυφλίναι ὑφείς ὅσαν, δ'ἐκτέκῃ, συμφίεται ταῦτα πάλίν.—Aristotle, Περι τα ξωα ίστοριων Ε (VI), cap. 13 (12).—I use the Paris edition of Didot (Opera, III, 1854).

[4] Aristotle, IX, 15.

[5] No reference is made anywhere to the green color characteristic of the bones of the gars.

[6] Hist. Brit. Birds, II, p. 344.

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female kingfisher deposits her round, shining-white eggs, from six to eight or nine in number.

The European kingfisher is a small bird, with a length of wing of about 3 inches. Therefore it can not catch garfishes, although it can capture small pipefishes, living, as they do, in shallow, reedy waters.

Another ancient equivalent of *βελόνη* was *ἀβλεννής*,[1] and that name, signifying "without mucosity," would be especially applicable to the pipefish and not to the gar.

Still another synonym of *βελόνη* was *ῥαφίς*. The *Rhaphis*, according to Aristotle, was toothless, thus contrasting with the formidably toothed gar and agreeing with the edentulous pipefishes. The synonymy of *Rhaphis* with *Belone* was declared by Dorio, according to Athenæus,[2] who said that the *βελόνη* was the same fish they called *ῥαφίς*. The name is also still retained in composition in Greece, the *Siphostoma acus* being known in some places as Saccorapha (*σακκοράφα*), according to Apostolides.[3]

So far, then, as all the statements respecting *Belone* and its synonyms, *Rhaphis* and *Ablennes*, are specific, they are applicable to the pipefishes and not to the garfishes. But surely, it may be urged, the garfish must have been noticed by Aristotle or some of the ancient writers. It undoubtedly was, and one of the names that has not been identified indicated that fish.

Aristotle, in referring to those fishes which are gregarious, names the *Sarginos* (*Σαργίνος*) just before the *Belone*.[4] This alone would show nothing and would cast no light on the special fish intended, but it so happens that very slight modifications of the same name (*σαργάννος*, *Ζαργάνα*) are still borne in Greece by the garfish, according to Erhard, Apostolides, and Hoffman. This fact, taken in connection with its habits and the juxtaposition of the name to *Belone*, as well as negative evidence, leaves little or no doubt that the *Sarginos*[5] of Aristotle was the garfish.

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[1] By a fortunate lapsus in transliteration, Dr. Jordan gave the name *Athlennes* (instead of *Ablennes*) to a subgenus of gars peculiar to America, and therefore only a meaningless name has resulted instead of the more objectionable perversion of an ancient one.

[2] Book VII, section 111.

[3] La Pêche en Grèce, p. 11.

[4] Aristotle, after distinguishing different kinds of gregariousness in fishes, collocates them as follows: *Ὅλως δ' ἀγελαῖά ἐστι τα τοιάδε, θυννίδες, μαινίδες, κωβιοι, βῶκες, σαῦροι, κορακῖνοι, σινόδοντες, τρίγλαί, σφύραιναι, ἀνθίαι, ἐλεγῖνοι, ἀθερῖνοι, σαργῖνοι, βελόναι, τενθοί, ἰουλίδες, πηλαμύδες, σκόμβροι, κολίαι.*—IX, chap. 2 (3).

[5] *Sarginos*, it has been said, "seems to be A derivative of *σαργός*," but this etymology appears to me to be very improbable, and the similarity of the two names is probably a mere accidental coincidence. A strange identification has been attempted of the *Sarginos* with the *Tetragonurus curieri*, or, in the words of Cresswell (Aristotle's History of Animals, p. 321), "*Tetragonus niger*." (It may be added that the page referred to in Cresswell's index should be "234" instead of "231.") There is, of course, not the slightest justification for such an identification.

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It is possible, too, although improbable, that in ancient times there may have been some confusion of the garfish with pipefishes, and that the former may have been considered as overgrown Belonides. It is still more possible, and even probable, that in the lapse of time such confusion had resulted and even culminated in the transfer of the name *Belone*, under the modified form *βελονίδα*, and to the garfish. Certain it is, at least, that Erhard and Apostolides[1] have given the last name as one now carried, as well as the others, by the garfish in Greece. It is proper to add, however, that their statement has not been confirmed by Professor Hoffman, who only heard *Zargana* applied to the garfish.

Apostolides himself[2] elsewhere uses only the name *Zargana*, as when he notices the fishes of passage[3] and those that are caught at certain seasons.[4]

It must be remembered also that the same name is not infrequently applied to animals differing greatly, because they have some superficial resemblance or adaptation. Thus, in Greece at the present day, the same name (*Chelidonopsaro*, *Χελιδονοψαρο*) is given to the flying fishes of the genera *Dactylopterus* and *Exocœtus*, although they differ greatly in almost every character and belong to different orders. The resemblance between a garfish and pipefish is at least as great as that between a dactylopterid and an exocœtid.

VI.

The synentognathous fishes were by most naturalists retained in the same family with the pikes from 1817 to 1845, when Müller segregated them as a peculiar family under the name *Scomberesoces*. There were, however, several dissentients from this view, and partial anticipations of modern views. The most prominent idea—and an erroneous one—was that the modification for emergence from the sea and sustentation in the air was of superior systematic value. On this assumption the flying fishes, or Exocœtines, were differentiated from all the other Synentognaths.

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[1] An analogous case of confusion and subsequent transfer of name by the modern Greeks to a quite different fish from that called by the same designation among the ancient Greeks, is furnished by *Scarus*. The *Scarus* (*Σκαρος*) of Aristotle was unquestionably the fish which still bears that name (or *Sparisoma scarus*) in ichthyological literature, but according to both Apostolides and Hoffman the title is now applied by some fishermen at least to a *Sargus* (*Diplodus vetula*). Even the name, as an independent species, of the fish so renowned and prized among the ancients (Nunc Scaro datur *principatus* [etc.], Pliny, IX, ch. 29), does not appear in the memoirs of either Apostolides or Hoffman and Jordan.

[2] La Pêche en Grèce, p. 32 (1883).

[3] Les pêcheurs distinguent bien les poissons qui, pendant toute l'année, ne quittent pas les côtes, et ceux qui y apparaissent à des époques déterminées. Ces derniers reçoivent le nom de passagers (*περαστικά*), tels sont les différentes espèces de Sardines, les Maquereaux, les Scombres maquereaux (*κολιοί*), les Saurels (*Σαυρίδια*), les Thons (*Μαγιάτικο*, poisson de mai), les Pelamydes et, dans certains endroits, les Bélones (*Ζαργάναί*).—La Pêche en Grèce, p. 36.

[4] Dans ce même mois [Septembre] se fait aussi la pêche des Bélones (*Ζαργάνες*), [etc.].—La Pêche en Grèce, p. 38.

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VII.

As early as 1850, Prince Bonaparte of Canino had used the names *Belonidæ* and *Exocætidæ*. In his "Conspectus Systematis Piscium," he proposed the following division of the Esoces or Synentognathi:

SECTION VI. PHARYNGOGNATHI.

ORDO 14. *Esoces.*

68. Belonidae.				
160. Belonini.....	6[1]	5	Med. Atl. Pac.....	80
69. Exocœtidae.				
161. Exocœtini.....	..	2[2]	Med. Atl. Pac.....	40
	6	7		120[3]

It will be evident to one familiar with the status of ichthyology in 1850, that the families so named have quite different limits from those later recognized. In fact, they are simply the subfamilies "Belonini" and "Exocetini" of Bonaparte's earlier systems, elevated to family rank. The Belonini were those with the pectorals normal (pinnæ pectorales congruæ) and jaws produced (mandibulæ longissimæ, in rostrum acutum protractum); they thus included not only Belonidæ as properly limited, but also Scomberesocinæ and Hemirhamphinæ. The Exocœtini were defined solely in the following terms: "Exocetini. Pinnæ pectorales maximæ, volatui aptæ."

As Bonaparte had, in the same "Conspectus," used the name *Luciidæ* in place of *Esocidæ* for the pikes, it is almost certain that he had been influenced by his knowledge of Rafinesque's work, and had adopted the names given by him.

VIII.

In 1872 Gill, in his "Arrangement of the Families of Fishes," divided the Synentognaths into two families.

Order SYNENTOGNATHI.

139. *Belonidæ* Scomberesocidæ, Gthr., VI, 233, 234–256.
140. *Scomberesocidæ* Scomberesocidæ, Gthr., VI, 233, 256–298.

By these references, the family Belonidæ was limited to the genus *Belone*, as recognized by Günther, and Scomberesocidæ to the genera *Scomberesox*, *Hemirhamphus*, *Arrhamphus* and *Exocœtus*, of the same author. Gill was led to this classification by a consideration of the relations of the intermaxillary and supramaxillary bones, and the development of the characteristic supplementary bone of the lower jaw.

[1] "Fossiles." [2] "Europ." [3] "Species viventes."

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In 1878 Professor Cope[1] defined the *Belonidæ* in the following terms:

The genus *Belone* must be placed in a family group distinct from that which includes the genus *Exocœtus* and its allies. I have already pointed out the fact that it possesses a distinct coronoid bone; in addition to this, the vertebræ display zygapophyses, a character unusual among fishes. On these two characters I propose the family Belonidæ. Professor Gill has already created this name, but he did not define the group to which he applied it.

These views were not adopted for some time by other authors, Messrs. Jordan and Gilbert and others preferring the older compound.

In 1885 Dr. Jordan[2] accepted the two families, Belonidæ and Scomberesocidæ, although, by a typographical slip, all were placed under the former name, the latter having been forgotten.

In 1888 Dr. Jordan[3] reverted back to the old views, combining all the Synentognaths in one family designated as *Exocœtidæ*.

Other historical data may be obtained by reference to the synonymy of the various types.

IX.

The gars have a lower jaw peculiar in that, in addition to the normal three bones (articular, angular and dentary), a fourth is developed continuous from the articular and lying mostly inside of the upper portion of the dentary. This element appears to have been unnoticed by most naturalists and to have been first observed by Dr. B. C. Bruhl.

In 1847 Bruhl[4] published a figure of the disintegrated right mandible in which the supplementary bone is marked "ZK". I have, however, been unable to find any reference to it in the text. In his observations on the lower jaw,[5] Bruhl indeed stated (erroneously) that an excess over three bones was found only in two fishes, *Lepidosteus* and *Osteoglossum*.[6]

In 1878 Professor Cope[7] recalled that he had "already pointed out that [*Belone*] possesses a distinct coronoid bone", and considered the

[1] Synopsis of the Fishes of the Peruvian Amazon, etc. (Proc. Am. Phil. Soc., XVII, 695.)

[2] Catalogue of the Fishes of North America, p. 59.

[3] A Manual of the Vertebrate Animals of the Northern United States, fifth edition, p. 91.

[4] Anfangsgrunde der vergleichenden Anatomie aller Thierklassen, Atlas, pl. XI. fig. 17.

[5] § 39. Der Unterkiefer.

[6] Vermehrung der Unterkiefertheile findet sich wirklich nur bei zwei Fischen: bei Lepidosteus osseus und Osteoglossum (nach Müller), die sechs Stücke in jeder Unterkieferhälfte zählen. Bei Anarrhichas lupus befindet sich (nach Duvernoy's Angabe, c. l. Tom. IV, Part I, pag. 20) die Gelenkfläche des Gelenkstückes an einem, vom übrigen Gelenkstücke getrennten Knöchelchen, das er subangulaire nennt. Das Vorkommen von vier Theilen in jeder Unterkieferhälfte bei Polypterus . . . bildet keine Ausnahme von der Normalzahl, [etc.].—Anfangsgrunde der vergleichenden Anatomie aller Thierklassen, p. 90.

[7] Proc. Am. Phil. Soc., XVII, 695.

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possession of that element to be one of the two cardinal characters distinctive of the family Belonidæ.[1]

It is not in *Belone* alone, however, that the supplementary bone in question occurs. It is also to be found (but in diminished proportions) in the other Synentognaths. It was found quite independently by a disciple of Dr. Jordan. In a letter to me dated April 24, 1894, Dr. Jordan wrote:

> According to Mr. Stark, one of my students who is working out their skeletons, there is a rudiment of this so-called coronoid in all the Synentognaths as well as in *Esox* [= *Belone*].

Dr. Jordan has aptly called the element in question the "so-called coronoid".[2] It can not be called appropriately the coronoid, as that term implies homology with the bone so called in Lepidosteids, and between those fishes and the Belonids is an impassable gap and a host of intervening forms without any corresponding bone. The bone in question, therefore, must have been independently developed, and consequently should receive a distinctive name. *Addentary* may be taken as a somewhat descriptive designation.

X.

In the present communication, I have preferred to adhere to my previous estimate of the Exocœtines, Scomberesocines, and Hemirhamphines, and have retained them as subfamilies. Dr. Jordan, however, has elevated them to family rank, and in a letter to me expressed the following sentiments:

> I am inclined to think that the flying-fishes and the half-beaks at least should be separated into distinct families, as the upper pharyngeals are fully united in the latter and separated in the flying-fishes and in *Scomberesox*. I am sure that differences of this grade would be accepted as family differences in large groups like the percoid fishes, and I do not see why they may not properly be so regarded here. There is, however, no doubt of the close union of these forms as compared with *Esox* [*Belone*].

Dr. Jordan's opinions are entitled to the utmost consideration, and it is quite possible that I may be convinced hereafter of the propriety of this enhanced valuation of the characteristics of the several groups in question. At present, however, it appears to me that the differences of the pharyngeals in certain groups recognized by both of us as natural families, are quite as great as those manifested in the forms still retained in the family of Exocœtids. Such are the Sciænids, the Pomacentrids, and the Labrids.

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[1] I have been unable to learn, either through an examination of Professor Cope's works or through the author himself, where he had previously pointed out that [*Belone*] possesses a distinct coronoid bone. Professor Cope was unable to find any previous notice.

[2] The "coronoid" of ganoids can not be homogenetic with the homonymous bone of reptiles, and, as the name appears to have been originally used in connection with the crocodile, the ganoid's may be called "coronine."

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XI.

Order SYNENTOGNATHI.

=*Pharyngognathi malacopterygii*, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 310, 1843; 16. Jahrg., I, p. 103, 1845; Abhandl. Akad. Wiss., 1842, p. 170. (Suborder.)

=*Esoces*, BONAPARTE, Consp. Syst. Piscium, Ordo 14, 1850. (Order.)

=Soft-finned Pharyngeal Fishes (*Malacopterygii*), ADAMS, Man. Nat. Hist., p. 106, 1854. (Suborder.)

=*Synpharyngodontes*, BLEEKER, Enum. Spec. Piscium Arch. Ind., p. xxx, 1859. (*Tribus* of Ordo *Esoces*.)

=*Synentognathi*, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 148 (1859). (Suborder.)

=*Malacopterygii pharyngognathi*, GÜNTHER, Cat. Fish. Brit. Mus., V, p. 1, 1865. (Suborder. Abandoned, and family *Scomberesocidæ* only recognized, VI, p. 233.)

=*Synentognathi*, COPE, Proc. Am. Assoc. Adv. Sci. 1871, XX, pp. 335, 338 (1872). (Order.)

=*Scombrésoces*, BLEEKER, Atlas Ich. Indes Néerland., VI, p. 40, 1866–72.

=*Synentognathi*, JORDAN and GILBERT, Syn. Fishes N. Am., pp. 367, 371, 1882. (Order.)

Family EXOCŒTIDÆ.

<*Siagonotes*, DUMÉRIL, Zool. Anal., p. 149, 1806.

×*Esocetini*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 35, 1810.

>*Sairidini*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 33, 1810.

<*Siagonia*, RAFINESQUE, Analyse Nat., p. 89, 1815.

<*Exoceides*, RISSO, Hist. Nat. de l'Europe Mérid., III, p. 440, 1826.

<*Scomberesoces*, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 312, 1843; 11. Jahrg., I, p. 102, 1845.

<*Scomber-Esoces* (*Scomberesocidæ*), AGASSIZ, Rept. Brit. Assn. Adv. Sci., 1844, p. 292.

>*Exocætidæ*, BONAPARTE, Catalogo Metodica dei Pesci Europei, pp. 8, 80, 1846.

>*Exocætidæ*. BONAPARTE, Consp. Syst. Ich., fam. 69, 1850.

×*Belonidæ*, BONAPARTE, Consp. Syst. Ich , fam. 68, 1850.

<*Scombersocidæ*, ADAMS, Man. Nat. Hist., p. 106, 1854.

<*Scomberesocidæ*, RICHARDSON, Encycl. Brit., 8 ed., XII, p. 264, 1856.

<*Scombresocoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxx, 1859.

×*Scomberesocoidæ*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.

>*Exocætoidæ*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.

<*Scombresocidæ*, GÜNTHER, Cat. Fish. Brit. Mus., VI, p. 233, 1866.

<*Scombresocidæ*, COPE, Proc. Am. Assoc. Adv. Sci., XX, p. 338, 1872.

=*Scomberesocidæ*, GILL, Arrang. Fam. Fishes, p. 14, 1872.

<*Scomberesoces*, FITZINGER, Sitz. K. Akad. Wissensch. Wien, LXVII, 1. Abth., p. 36, 1873.

<*Scombresocidæ*, POEY, Anal. Soc. Esp. Hist. Nat., IV, p. 9, 1875.

<*Scomberesocidæ*, JORDAN and GILBERT, Syn. Fishes N. America, pp. 75, 371, 1882.

Diagnosis.—Synentognathi with the supramaxillaries only in contact with the intermaxillaries, the mandible with a reduced intradentary bone, the hypopharyngeals united in a broad triangular body, the third pair of epipharyngeals much enlarged, those of the fourth pair aborted or united with the third, and the vertebræ without zygapophysoid processes.

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Subfamily SCOMBERESOCINÆ.

=*Scomberesocinæ*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.
=*Scomberesocinæ*, JORDAN and GILBERT, Syn. Fishes N. A., p. 372, 1882.
Sphyrenidia genus, RAFINESQUE, 1815.

Diagnosis.—Exocœtids with both jaws more or less elongated and attenuated forward, pectoral fins moderate, and the epipharyngeals of the third pair separate from each other.

Two genera are known.

Genus SCOMBERESOX.

Scomberesox, LACÉPÈDE, Hist. Nat. des Poissons, V, p. 344, 1803.
Sayris, RAFINESQUE, Car. Alc. Gen. e Sp., p. 60, 1810; Anal. Nat., p. 89, 1815.
Les Scombrésoces, CUVIER, Règne Animal (1re éd.), II, p. 186, 1817.
Scomberesox, CUVIER and VALENCIENNES, Hist. Nat. des Poissons, XVIII, p. 460, 1846.
Grammiconotus, COSTA, Ann. Mus. Zool. Napoli, 1862, p. 55.
Scombresox, GÜNTHER, Cat. Fish. Brit. Mus., VI, p. 256, 1866.

From this genus should be removed the *S. brevirostris* of California, which is distinguished by the short or curtailed forceps-like jaws.

Genus COLOLABIS.

Cololabis, GILL, MSS.
Scombresox, sp., PETERS et al.

Type *C. brevirostris*.

Subfamily EXOCŒTINÆ.

< *Lepomia*, RAFINESQUE, Analyse Nat., p. 88, 1815.
= *Exocœtini*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo), p. 94, 1832.
< *Exocetinæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, p. 296, 1839.
= *Exocœtini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 133, 1838; IV, p. 274, 1840.
= *Exocœtini*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. 30, 1859.
= *Exocœtiformes*, BLEEKER, Atlas Ich. Indes Néerland., VI, p. 67, 1866–72.
= *Exocœtinæ*, JORDAN and GILBERT, Syn. Fishes N. Am., p. 372, 1882.

Diagnosis.—Exocœtids with both jaws rounded or simply angulated forward, pectoral fins enlarged and adapted for sustentation of the body in the air, and the epipharyngeals of the third pair separate.

Genus EXOCŒTUS.

Exocœtus, LINNÆUS, Syst. Nat., 10th ed., I, p. 316, 1758 (*E. volitans*, only sp.).
Exocœtus, WEINLAND, Proc. Boston Soc. Nat. Hist., VI, p. 385, 1859.
Cypselurus, SWAINSON, Nat. Hist. Fishes, etc., II, p. 296, 1839.
Ptenichthys, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 312, 1843.

Genus HALOCYPSELUS.

Halocypselus, WEINLAND, Proc. Boston Soc. Nat. Hist., VI, p. 385, 1859 (*mesogaster*).

Genus PAREXOCŒTUS.

Parexocœtus, BLEEKER, Nederl. Tydschr. Dierk., III, p. 105, 1865.

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Genus FODIATOR.

Fodiator, JORDAN and MEEK, Proc. U. S. Nat. Mus., VIII, p. 45, 1885.

Subfamily HEMIRHAMPHINÆ.

= *Hemirhamphinæ*, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 148 (1859).
= *Hemirhamphinæ*, POEY, Anal. de la Soc. Esp. de Hist. Nat., IV, p. 38, 1875.
= *Hemirhamphinæ*, GILL, Cat. Fishes E. Coast N. America, VI, p. 38, 1872.
= *Hemirhamphiformes*, BLEEKER, Atlas Ich. Indes Néerland., VI, p. 51, 1866-72.
= *Hemirhamphinæ*, JORDAN and GILBERT, Syn. Fishes N. Am., p. 372, 1882.

Diagnosis.—Exocœtids with the upper jaw angulate and the lower produced into an elongated beak, pectoral fins moderate or little enlarged, and the epipharyngeals of the third pair closely united in a transverse plate.

Genus EULEPTORHAMPHUS.

Euleptorhamphus, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 156 (1859).

Genus OXYPORHAMPHUS.

Oxyporhamphus, GILL, Proc. Acad. Nat. Sci. Phila. 1863, p. 273 (1863).

Genus ZENARCHOPTERUS.

Zenarchopterus, GILL, Proc. Acad. Nat. Sci. Phila. 1863, p. 273 (1863).

Genus CHRIODORUS.

Chriodorus, GOODE and BEAN, Proc U. S. Nat. Mus., V, p. 432 (1882).

Genus DERMOGENYS.

Dermogenys, VAN HASSELT. Algem. Konsten Letterb., 1823, No. 35, p. 131 (fide Bleeker).
Dermogenys, (VAN HASSELT) BLEEKER. Ned. Tydschr. Dierk., III, p. 165, 1865.
Dermatogenys, GÜNTHER, Cat. Fish. Brit. Mus., VI, pp. 260, 275, 1866. (Subgenus.)
Hemirhamphus, sp., GÜNTHER.

Genus HEMIRHAMPHODON.

Hemirhamphodon, BLEEKER, Ned. Tydschr. Dierk., III, p. 139, 1865.
Hemirhamphus, sp., GÜNTHER.

Genus ARRHAMPHUS.

Arrhamphus, GÜNTHER, Cat. Fish. Brit. Mus., VI, pp. 233, 277, 1866.
Oxyporhamphus, sp., BLEEKER.

Genus HEMIRAMPHUS.

Hemiramphus, CUVIER, Règne Animal, II, p. 374, 1817.

Genus HYPORHAMPHUS.

Hyporhamphus, GILL, Proc. Acad. Nat. Sci. Phila. 1859, p. 131 (1859).

Family ESOCIDÆ.

<*Siagonotes*, DUMÉRIL, Zool. Anal., p. 149, 1806.
<*Esocidi*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 34, 1810.
<*Siagoia*, RAFINESQUE, Analyse de la Nature, 23. fam., p. 89, 1815.

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<*Esoces*, CUVIER, Règne Animal, 1e éd., II, p. 182, 1817; 2e éd., II, p. 281, 1829.
<*Esocidæ*, FLEMING, Phil. Zool., p. 385, 1822.
<*Esociens, Esocii*, LATREILLE, Fam. Nat. Règne An., p. 121, 1825.
<*Exoceides*, RISSO, Hist. Nat. Europe Mérid., III, 1826.
<*Esocidæ*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo), p. 94, 1832.
<*Esocidæ*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 133, 1838; IV, p. 273, 1840.
<*Salmonidæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 184, 283, 1839.
<*Brochets ou Lucioïdes*, VALENCIENNES, Hist. Nat. Poiss., XVIII, 1846.
<*Belonidæ*, BONAPARTE, Consp. Syst. Ich., fam. 68, 1850.
=*Belonidæ*, GILL, Arrang. Fam. Fishes, p. 14, 1872.
=*Belonidæ*, COPE, Proc. Am. Phil. Soc., XVII, p. 695, 1878.
=*Belonidæ*, JORDAN and FORDYCE, Proc. U. S. Nat. Mus., IX, 1886, p. 339.

Diagnosis.—Synentognathi with the supramaxillaries united by suture with the intermaxillaries, the mandible with an elongated intradentary bone, the hypopharyngeals united in a narrow body, the third pair of epipharyngeals little enlarged, those of the fourth pair distinct from the third and from each other, and the vertebræ with distinct zygapophysoid processes.

Subfamily ESOCINÆ.

<*Esoxidia*, RAFINESQUE, Analyse Nat., p. 89, 1815.
<*Belonini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 133, 1838; IV, p. 274, 1840.
<*Beloneini*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxx, 1859.
=*Belonina*, GILL, Cat. Fishes E. Coast N. America, p. 38, 1861.
=*Belonini*, POEY, Anal. de la Soc. Esp. de Hist. Nat., IV, p. 9, 1875.
=*Mastacembeliformes*, BLEEKER, Atlas Ich. Indes Néerland., VI, p. 43, 1866–72.
=*Belonina*, JORDAN and GILBERT, Syn. Fishes N. America, p. 372, 1882.

Genus ESOX.

Mastacembelus, KLEIN, Hist. Pisc. Nat., IV, p. 21, 1744.
Esox, LINNÆUS, Syst. Nat., ed. 10, I, p. 313, 1758.
Esox, RAFINESQUE, Car. alc. Gen. e Sp., p. 59, 1810.
Raphistoma, RAFINESQUE, Anal. Nat., p. 89, 1815.
Belone, CUVIER, Règne Animal, II, p. 185, 1817.
Ramphistoma (RAFINESQUE) SWAINSON, Nat. Hist. Fishes, etc., II, p. 296, 1839.
Macrognathus, GRONOW, p. 147, 1854.
Mastacembelus, BLEEKER, Nederl. Tijdskr. Dierk., III, p. 214, 1866.

Genus TYLOSURUS.

Tylosurus, COCCO, Giorn. Sc. Lett. e Arte Sicil., "XVII, p. 18, 1829".
Tylosurus, JORDAN and GILBERT, Syn. Fishes N. Am., p. 372, 1883.

Genus ATHLENNES.

Athlennes, JORDAN and MEEK, Proc. U. S. Nat. Mus., IX, p. 343 (subgenus), 1886.
Athlennes. JORDAN, Man. Vert. An. N. U. S., 5th ed., p. 92 (genus), 1888.

Genus POTAMORRHAPHIS.

Potamorrhaphis, GÜNTHER, Cat. Fish. Brit. Mus., VI, pp. 234, 256 (subgenus), 1866.
Lymnobelus, AGASSIZ, Journey to Brazil, p. 237, 1868.

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ON THE APPLICATION OF THE NAME TEUTHIS TO A GENUS OF FISHES.

By THEODORE GILL, LL. D.

TWO SPECIES were originally referred to the genus *Teuthis* by Linnæus, one of which was later referred to the genus *Siganus* or *Amphacanthus*, and the other to the genus *Acanthurus*. There has been much diversity of opinion among recent authors respecting this usage. Dr. Günther has taken *Teuthis* for *Siganus*, and I have adopted the name in place of *Acanthurus*. Dr. Jordan has wavered between the two systems. Immediately after the publication of articles by Gill,[1] and Meek and Hoffman,[2] in which *Teuthis* was accepted instead of *Acanthurus*, he adopted the name with the same sense.[3] Later he dissented and expressed the opinion that "the change of the name of this genus from *Acanthurus* to *Teuthis*, as made by Gill and Meek, seems unnecessary. The name *Teuthis* was based by Linnæus on *T. hepatus* and *T. javus*. Its first restriction was to the latter species, a representative of the *Teuthis* of Günther, the *Siganus* of Forskål."[4] He has adhered to this opinion since.[5] I shall now proceed to demonstrate that this opinion is the result of an imperfect view of the literature.

I.

The name *Hepatus* was introduced informally into ichthyology by Artedi in 1738 and afterwards employed with a generic diagnosis by Gronow (Latin, *Gronovius*). Gronow, in his "Zoophylacium," recognized two species: (1) *Hepatus cauda fronteque inermibus*, and (2) *Hepatus mucronereflexo utrinque prope caudam;* the former is an Acanthurid and the latter a Siganid or Amphacanthid. Further, the Acanthurid

[1] Proc. U. S. Nat. Mus., VII, pp. 275–281, 1884.

[2] Proc. Acad. Nat. Sci. Phila. 1884, pp. 227–231 (1884).

[3] Proc. U. S. Nat. Mus., VIII, p. 386, 1885.

[4] Proc. U. S. Nat. Mus., IX, p. 49, 1886.

[5] Proc. U. S. Nat. Mus., XI, p. 552, 1888; XII, p. 650, 1889; XIII, p. 323, 1890; XIV, p. 113, 1891, etc.

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was described from a specimen of the West Indian *A. chirurgus*, which was recorded by Dr. Günther[1] in 1861 as being then in the British Museum.

II.

The name *Teuthis* was introduced in the twelfth edition of the Systema Naturæ by Linnæus[2] as a substitute for *Hepatus*, and in fact his knowledge of the group so called was originally chiefly derived from Gronow. From misapprehension as to the position of the ventral fins, he referred it to the "Pisces Abdominales" between *Silurus* and *Loricaria*, and it must be here recalled that he had already recognized three species of Acanthurids which he associated with the Chætodons, viz: *C.* (10) *nigricans*, *C.* (12) *lineatus*, and *C.* (13) *triostegus*. Had it not been for the misapprehension, he would doubtless have referred his species of *Teuthis* also to *Chætodon*. Linnæus was inferior as an ichthyologist to both Artedi and Gronow, and the only reason for rejecting the earlier and adopting his later name for a genus, is because the binomial nomenclature was not adopted by Gronow in the work cited. Accepting, as we do, these principles, we commence with Linnæus, and first have to inquire what that naturalist actually meant. All that is published in the twelfth edition of "Systema Naturæ"[3] concerning *Teuthis* is here reproduced, it being recalled that the genus was referred to the Pisces Abdominales.

176. TEUTHIS. *Caput* antice subtruncatum.
Membr. branch. radiis V.
Dentes simplici serie, æquales, rigidi, approximati.

HEPATUS. 1. T. spina utrinque caudali recumbente mobili.
Brown. jam. 455. Teuthis fusca cæruleo nitens, aculeo simplici utrinque ad caudam.
Gron. zooph. 353. Hepatus mucrone reflexo utrinque prope caudam. D $\frac{9}{34}$ P. 16. V. $\frac{1}{5}$ A. $\frac{3}{26}$ C. . .
Seb. mus. 3, p. 104, *t.* 33, *f.* 3. Chætodon cærulescens, dorso nigro, cauda æquali exalbido nigroque varia.
Catesb. car. 2, *p.* 10, *t.* 1, *f.* 1. Turdus rhomboides.
Valent. ind. 3, *f.* 77, 383, 404.
Habitat in Carolina, Amboina.
Caput *maxime declive*. Dentes *æquales, rigidi, unica serie*. Pinna dorsalis *radiis primis* 8 *spinosis*. Ventrales 1 *spinoso*. Analis 3 *spinosis*. *Ad utrumque latus caudæ* Spina *valida, subulata, mobilis, erigibilis, recumbens, in sulco latitans*.

JAVUS. 2. T. cauda utrinque mutica. *Gron. zooph.* 352. Hepatus cauda fronteque inermibus. D. $\frac{1}{3}\frac{9}{4}$ P. 15. V. $\frac{1}{5}$ A. $\frac{1}{26}$ C.
Valent. ind. 3, *p.* 339, *f.* 410. Leervisch.
Habitat ad Javam.
Corpus *maculis longitudinalibus cærulescentibus*. Cauda *lunata*. Pinnarum ventralium *radius primus et ultimus spinosus*.

[1] Cat. Fish. Brit. Mus., III, p. 330.
[2] Linnæus, Syst. Nat., I, p. 507.
[3] Vol. I, p. 507.

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The first of these species is evidently the same as the second species of *Hepatus*, while the second is the first species of *Hepatus* of Gronow's system. Linnæus did not know these species, as such, through autopsy, and derived his knowledge of them almost entirely from Gronow, simply adding some synonyms, in several cases erroneously.

I repeat that the genus *Teuthis* of Linnæus was purely the result of misapprehension or ignorance; and the genus being misplaced in the order Abdominales, its characters contrast with those of any genus of that order, but not with those of species referred to the Thoracici, some of whose representatives, retained in the genus *Chætodon*, have precisely the same characters, and in fact are nearly related congeners of one of the species of *Teuthis*. The characters selected for the generic diagnosis, too, are of the least value and not even applicable in all cases, the only important characteristic being the dentition, and in the expression thereof Linnæus was more successful than Gronow, although in other respects much inferior.

Although almost all of the Linnæan genera were composite and many of them embraced representatives of a number of distinct families, the fact that the Swedish naturalist referred two generic types to *Teuthis* has appeared to some good ichthyologists a sufficient reason to ignore the name for either. Thus both Kner and Klunzinger adopted the names *Amphacanthus* and *Acanthurus*.

Kner remarked:[1]

Der Name *Teuthis* dürfte kaum berechtigt sein, obigen Gattungsnamen wieder zu verdrängen, da Linné ihn wohl für einige Arten dieser, aber auch der Gatt. *Acanthurus* benützte.

Klunzinger observed:[2]

Der Name *Amphacanthus* ist vorzuziehen, da Linné unter dem Namen *Teuthis* sowohl einen *Amphacanthus* als einen *Acanthurus* beschrieben hat.

III.

In 1775 Forskål, in his "Descriptiones Animalium [etc.] quæ in itinere orientale observavit," introduced new generic or group names for species severally congeneric with the species of *Hepatus* or *Teuthis*, in a somewhat informal manner, but which, nevertheless, admits of no doubt as to his meaning and intent. The data may be given in the order of the volume.

First, on the reverse of the false title page (ii, but not numbered) succeeding the introduction and table of contents, is a list of "Nova Genera," among which four "Piscium" are named, viz:

Salaria. (Gadus 3.)
Scarus. (Scarus 11–18.)
Siganus. (Scarus 9–10.)
Acanthurus. (Chætodon 88–89.)[3]

[1] The numbers after the genera refer not to the number of species in the respective genera, but to the serial numbers of all the fishes described.

[2] Kner, Novara Exped. Fische, p. 205, 1865.

[3] Verh. k. k. zool.-bot. Ges. Wien, XXI, p. 501, 1871.

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Secondly, in the succeeding "Faunæ Orientalis Conspectus" prefatory to the "Descriptiones Animalium"[1] the following names are to be found:

Scarus: novum genus. Σκάρος.
9 (*a*) *rivulatus:* *Djezavi* vel *Sigân*. [Arabic letters.] Nov. genus: *Siganus*.
10 (*b*) stellatus. Ghæjehân. [Arabic letters.]

No corresponding mention of the name *Acanthurus* occurs under *Chætodon*.[2]

Thirdly, on referring to the text (page 25) these species are mentioned in the following terms:

Scarus novum genus antiquo nomine Σκάρος. Character genericus: Dentium loco maxillæ ipsæ eminentes, margine dentato-crenatæ, osseæ.
9. Scarus siganus; rivulatus; maxillis continuis, complanatis, margine serrato-denticulatis: denticulis approximatis, filiformibus; a medio labio paulatim decrescentibus.

[A detailed description of the species follows.]

Obs. Videtur genus proprium una cum sequente constituere; quum habitus prorsus proprius. Nomen *Sigani* desumtum ex Arab. Sidjan vel Sigian.
10. Scarus stellatus; ovalis fasciis annulis cæruleo-pallidis, subhexagonis, undique contiguis.

The name *Siganus* was thus (1) formally proposed as that of a new genus or "novum genus"; (2) the diagnosis of the "*Scarus siganus*" was related intentionally to the generic characters, as will be perceived by a comparison of it with that of the succeeding, and (3) the group was recognized as a natural genus on account of the peculiar habit or appearance of the two species for which it was proposed.

The "new genus" was quite properly adopted by Cuvier, for a time at least.

In connection with *Chætodon*,[3] a proposition was made to distribute the species of the Linnæan genus among three subdivisions, as follows:

Genus hoc subdivisionem admittit: (*a*) *Chætodon:* dentibus filiformibus, brevibus, numerosis, multorum ordinum, densis, acutis, inferioribus sensim minoribus. P. Br. radiis 6. Spinæ P. A. 3. (*b*) *Abu-def duf:* dentibus maxillaribus unius seriei, filiformibus, contiguis, submobilibus, obtusis, dentibus faucium nullis, annulo subtus circa oculos. P. Br. rad. 5. Spinæ P. A. 2. (*c*) *Acanthurus:* dentibus unius seriei, rigidis, acutis, contiguis, vel simplicibus vel lobatis. Cauda in utroque latere aculeo uno vel pluribus; exserto et rigido; vel mobili et recondendo. Diversum prorsus a Chætodonte genus; aliquando propriam constituens familiam.

This procedure was even less formal than the introduction of the genus *Siganus*, but, nevertheless, the name *Acanthurus* has been very generally accepted as a generic name for the species of the family distinguished by the characters attributed to it.

It is again to be recalled that the first Linnæan species of *Teuthis* is congeneric with the *Acanthuri* of Forskål, while the other is congeneric with the two *Sigani* of the same author.

[1] Page x. [2] Pages xii, xiii. [3] Page 25.

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IV.

In 1817 Cuvier, in the first edition of the "Règne Animal"[1] adopted the two genera of Forskål with the following names:

Les Sidjans. (*Amphacanthus.* Schn.)
Les Acanthures. Bl. (*Theutis.* L. *Harpurus.* Forsk.)

If this means anything, it must be that he would adopt the name "Theutis" for, or at least limit it to, the "*Acanthures*," but the meaning is certainly ambiguous; the restriction, however, is not.

In 1829 Cuvier, in the second edition of the "Règne Animal,"[2] retained the same genera under a different guise, viz:

Les Sidjans. (*Siganus.* Forsk.) *Buro* de Commerson; *Centrogaster* de Houttuyn; *Amphacanthus* de Bloch.
Les Acanthures (*Acanthurus.* Lacép. et Bl.). *Harpurus.* Forster. Vulgairement Chirurgiens.

Here the name "*Theutis*" or "*Teuthis*" is entirely ignored, but *Siganus* is accepted as the scientific name of the genus with the limits assigned to it by Forskål.

In 1822 Fleming[3] admitted as genera of the fourth section "(d)" of "Scomberidæ," the genera "140, *Amphacanthus* (*Scarus siganus*)," "141, *Theutis* (*T. hepatus*)," and "142, *Naseus.*" *Theuthis* (*Teuthis*) is thus definitely restricted by specific mention of type to the surgeon-fishes.

In 1832 Minding, in his "Lehrbuch der Naturgeschichte des Fisches,"[4] adopted the same two genera with the following names:

(1) Sidian, *Amphacanthus.*
(2) Felsenfisch, *Teuthis;* (*Τευθίς* eine Sāpienart bei den Gr.).

One species was mentioned, the "Wundarzt, *T. chirurgus.*"

In 1833 Bonaparte (then Prince of Musignano), in the second part of his "Saggio di una Distribuzione metodica degli Animali Vertebrati," gave the following genera under Teuthididæ:[5]

158. Siganus, Forsk. (*Buro, Comm. Centrogaster, Houtt. Amphacanthus, Bl.*) M. Indico. 20.
159. Teuthis L. (*Acanthurus, Lacép.; Harpurus, Forst.*; *Aspisurus, Lacép.* del.) Atl. Pac. fra i Trop. 25.
1. Teuthis, Nob.
2. Acanthurus, Nob.
3. Scopas, Nob.
4. Ctenodon, Nob.

Both names (*Siganus* and *Teuthis*) were thus again used with the limits still retained by me.

[1] Vol. II, p. 330.
[2] Vol. II, p. 223.
[3] Philosophy of Zoology, p. 396.
[4] Page 111.
[5] The other genera of Teuthididæ admitted were: 160, Prionurus, Lacép.; 161, Naseus, Commers. (*Monoceros, Bl.*); 162, Axinurus, Cuv.; 163, Priodontichthys, Nob. (*Priodon, Cur.*).

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V.

Far from the "first restriction" of *Teuthis* being to *Siganus* (as claimed by Jordan), it was not till near the close of the first half of the nineteenth century that any proposition to that effect was published.

In 1849 Dr. Cantor,[1] in his Catalogue of Malayan Fishes, used the name *Teuthis* in place of *Siganus* or *Amphacanthus*.

In 1854 Dr. Gray published a "Catalogue of Fish collected and described by Lawrence Theodore Gronow," now in the British Museum, and this was the first publication of a manuscript of that great ichthyologist, who died in 1778. Unfortunately no attempt was made by an editor to collocate the sheets in systematic order,[2] and hence we find closely allied genera often widely removed and approximated to those with which they have no affinity. Among those widely separated are *Teuthis* (p. 142) and *Acronurus* (p. 190). The former name had been substituted by Gronow for his own *Hepatus*, but restricted to the Sigani, and the latter was a new name for the Acanthuri.

In 1861 Dr. Günther[3] followed Cantor and Gronow in retaining the name *Teuthis* for the amphacanthoid fishes and *Acanthurus* for the surgeon fishes; he also revived the name *Acronurus* for what are now known to be young of the Acanthuri, although none were known to Gronow himself.[4]

The example thus set by Dr. Günther has been generally followed by his successors.

VI.

It may become known to some, that about 1840 Bonaparte recognized two families bearing the same names as the Güntherian—Teuthididæ and Acanthuridæ,—and it might naturally be supposed that the names represented the same groups defined by Günther. Even if such were the case, the past nomenclature would not be affected thereby, and at most a change of opinion on the part of Bonaparte would have been manifested. Nevertheless, even such change did not really take place, and the names in question simply indicate a strange mental phase or confusion that existed for a short time. The status may be of sufficient interest to detail.

[1] Journal of the Asiatic Society of Bengal, XVIII, p. 1189.

[2] "Some person, evidently not the author, or one well conversant with the subject, has marked the genera in the manuscript," which had never been sewed together, with a consequent number. (Gray in Preface, pp. vi, vii.) The sequence of the Zoophylacium should have been adopted.

[3] Catalogue of the Acanthopterygian Fishes, III, p. 313.

[4] "The name is taken from Gronow, who intended to apply it to fishes of this family." (Günther, III, p. 345.)

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Bonaparte's views as to the Teuthididæ, from time to time, are as follows:

Family TEUTHIDIDÆ.

1833.

Teuthididæ, BONAPARTE, Saggio Distr. Metod. Animal Vertebr., p. 34, 1833.

1838.

Teuthydidæ, BONAPARTE, N. Annal. Sc. Nat., Anno 9, II, p. 133 (Cycloidei), 1838.

1840.

Acanthuridæ, BONAPARTE, N. Annal. Sc. Nat., Anno 2, IV, p. 190 (Ctenoidei), 1840.
Teuthididæ, BONAPARTE, N. Annal. Sc. Nat., Anno 2, IV, p. 274 (Cycloidei), 1840.

1841.

Acanthuridi, BONAPARTE, Fauna Ital., Pesci, Int., p. [6].
Theuthydidi, BONAPARTE, Fauna Ital., Pesci, Int., p. [11].

1846.

Teuthyidæ, BONAPARTE, Cat. Metod. Pesci Europei, p. 7 (with subfamilies Amphacanthini and Teuthyini), 1846.

1850.

Teuthydidæ, BONAPARTE, Consp. Syst. Piscium, 1850.

Originally Bonaparte adopted the family Theutyes of Cuvier, with the same limits attributed to it by the great anatomist, but provided the regularly formed family name Teuthididæ (1833) or, less correctly, Teuthydidæ (1838).

In 1840, however, he widely separated the constituents of the old family in the following manner, only special characters being here reproduced:

CTENOIDEI.

Familia 18. ACANTHURIDÆ. ——Squamis ruvidis.[1]
Subfamilia 47. *Acanthurini*. Radii dorsales spinosi a mollibus haud distincti: pinnæ ventrales thoracici.

CYCLOIDEI.

Familia 45. TEUTHIDIDÆ. ——; radii spinosi plures in pinna dorsali, unus saltem in anali et in utraque ventrali.
Subfamilia *Teuthidini*. Pinna dorsalis unica.

The Acanthuridæ contain typical representatives of the family so called, but the Teuthididæ do not answer at all to the Siganids. The attribute of several dorsal spines and at least a single spine in the anal and each ventral, as well as the single dorsal fin, are descriptive only of Acanthurids, and not Siganids. The cycloid scales are the only characters distinctive of Siganids, and in 1842 Agassiz, in the seventeenth

[1] There is no adjective *ruvidus* in classical Latin, and it is not evident why *scabris* should not have been used as the exact equivalent of what Bonaparte meant, instead of a latinized form of the Italian ruvido.

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livraison of his "Poissons,"[1] gave the following views respecting the Teuthyes:

De la famille des Teuthyes.

Cette petite famille, qui n'est composée [sic] que de quelques genres, se distingue assez facilement par ses écailles, d'une petitesse extrême, répandues en très-grande quantité sur toute la peau. Il faut en éliminer le genre Amphacanthus, que ses grandes écailles cycloidiques et ses autres caractères zoologiques obligent à placer dans une autre famille. Chez le reste des Teuthyes, et notamment chez les Acanthures et les Naseus, les écailles forment de petites esquilles transparentes, lisses, dépourvues de tout ornement et hérissées, au bord postérieur, de quelques petites épines assez effilées, qui ressemblent un peu à celles que nous avons rencontrées chez les Zanclus de la famille des Squamipennes.

Perhaps it was this publication that again drew Bonaparte's attention to the families, for soon afterwards he reverted to his original views as to the limits of the family, recombining his Teuthididæ and Acanthuridæ in a single family, at first (1846) under the name Teuthyidæ, and later (1850) again resuming the name Teuthydidæ. He made an advance, however, in the recognition of two subfamilies, Amphacanthini and Teuthyini (1846) or Teuthidinæ (1850).

VII.

Teuthis is one of the many names inflicted on scientific nomenclature by Linnæus as a result of his proclivity to take classical names and pervert them to the designation of forms which are not related to and possess no intimate characters or analogies in common with the species to which they were originally applied. The *Teuthis* (*Τευθίς*) of the Greeks was a squid (Loliginid), but there was also a gregarious fish mentioned once by Aristotle[2] as the *Teuthos* (*Τευθός*) and respecting which nothing more is known.[3] It may be that Linnæus intended to take the latter name, but in fact he took the former, and, therefore, as long as the present code of nomenclature is retained, the surgeon-fishes, belonging to a family entirely unknown to the Greeks, must bear a name originally given to squids.[4] The name *Teuthos*, however, would only have the advantage in that it belonged to a fish, and its exact pertinence is unknown.

Teuthis itself has not been retained unimpaired. It was transformed into *Theuthis* and *Theutis* by Cuvier (1798 and 1817), and gave rise to the family name *Theuties*,[5] *Teuthyei*,[6] *Teuthyes*[7] and *Teuthyæ*,[8] of Agassiz.

[1] Vol. I, p. 88.

[2] Vol. IX, Chap. 3.

[3] It is quite possible that the *Τευθος* may have been placed among the true fishes inadvertently, or that some error of a copyist has crept in. *Teuthis* and *Teuthos* are both used by Aristotle as names of different kinds of squids.

[4] The case is just as bad, if not worse, if Teuthis is used for the Siganids.

[5] *Theuties*, Agassiz, Poiss. Foss., IV, pp. xiii, 212.

[6] *Teuthyei*, Agassiz, Poiss. Foss., IV, p. 41.

[7] *Teuthyes*, Agassiz, Poiss. Foss., I, 88; IV, p. 206.

[8] *Teuthyæ*, Agassiz, Rep. Brit. Assn. Adv. Sci., 1844, p. 288.

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Inasmuch as the oblique cases take -ιδ (*Τευθίς*, -ιδος), the proper form of the family name is *Teuthididæ*.

VIII.

The foregoing citations (which might have been much increased) are sufficient to demonstrate that *Teuthis* should be used in place of *Acanthurus* and not of *Siganus*. From whatever point of view we look, we are forced to this conclusion.

1. The first species of *Teuthis* was an Acanthurid.
2. The genus *Siganus* always appeared before *Acanthurus*, as well in the list of new genera and the table of contents, as in the descriptive portion of Forskål's work.
3. The genus *Teuthis* was first reduced by elimination to an Acanthurid.
4. The name *Teuthis* was first positively restricted to Acanthurids.

The conclusions thus formulated may be supplemented by a summary of the synonymy and diagnosis of the genus *Teuthis* as now limited.

Genus TEUTHIS.

<*Hepatus*, GRONOW, Zoophylacium, p. 113, 1763.
<*Teuthis*, LINNÉ, Systema Naturæ, 12th ed., I, p. 507, 1766.
<*Acanthurus*, FORSKÅL, Descriptiones Animalium, p. 25, 1775 (section of *Chætodon*, Linn.).
<*Harpurus*, FORSTER in Linnæi Syst. Nat., ed. Gmelin, I, p. 1269?, 1788.
<*Acanthurus*, BLOCH, Systema Ichthyologiæ, ed. Schneider, p. 211, 1801.
×*Aspisurus*, LACÉPÈDE, Hist. Nat. des Poissons, IV, p. 556, 1802.
<*Les Theuthies* (*Theuthis*), CUVIER, Tab. El. Hist. Nat., an. 6, p. 371 (1798).
<*Les Acanthures* BL. (*Theutis*, L.; *Harpurus*, Forsk.), CUVIER, Règne Animal, II, p. 330, 1817.
<*Theuthis*, FLEMING, Phil. Zool., p. 396, 1822.
<*Les Acanthurus*, LACÉPÈDE et BLOCH; CUVIER, Règne Animal, 2d ed., II, p. 223, 1829.
<*Teuthis*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo), p. 34, 1833.
‡‡*Acanthurus*, BONAPARTE, Giorn. Accad. di Scienze, LII (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo), p. 34, 1833. (Subgenus of *Teuthis* without diagnosis or type.)
<*Teuthis*, MINDING, Lehrb. Naturg. Fische, p. 111, 1832.
>*Acanthurus*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 255, 1839.
>*Teuthys*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 255, 1839.
×*Ctenodon*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 255, 1839.
=*Acronurus*, GRONOW, Cat. of fish collected and described, p. 142, 1854.
=*Acanthurus* § 1, GÜNTHER, Cat. Fish. Brit. Mus., III, pp. 325, 327, 1861.
=*Acronurus*, GÜNTHER, Cat. Fish. Brit. Mus., III, p. 345 (young).
<*Rhombotides*, BLEEKER.
<*Acanthurus*, KNER, Novara Exped., Fische, pp. 210, 212 (excludes *Scopas* and *Acronurus*).
=*Acanthurus A. Rhombotides*, DAY, Fishes of India, I, p. 202, 1876.
<*Acanthurus*, GÜNTHER, Ann. and Mag. Nat. Hist., (4), VIII, p. 320, 1871 (including *Acronurus* and *Keris* as probable young).
<*Acanthurus*, GÜNTHER, Journ. Mus. Godeffr., IX, p. 106, 1875.
=*Teuthis*, GILL, Proc. U. S. Nat. Mus., VII, p. 278, 1884.

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Diagnosis.—Teuthidids with a pair of antrorse movable caudal spines, strong fixed teeth, 5-rayed ventrals, and generally 9 (rarely 7 or 8) dorsal spines.

Type.—*T. hepatus*, LINNÆUS=*Acanthurus chirurgus*, BLOCH, etc.

The forms actually belonging to the genus *Teuthis* as here understood are the following:

Present names.	Names of Günther under Acanthurus.
Teuthis triostega	*Acanthurus triostegus*, Linnæus.
T. guttata	*A. guttatus*, Forst.
T. hepatus	*A. chirurgus*, Bloch.
T. matoides	*A. matoides*, C. & V.
T. nigrofuscus	*A. nigrofuscus*, Forsk., 1775.
T. bipunctatus	*A. bipunctatus*, Gthr., 1861.
T. nigroris	*A. nigros*, Gthr., 1861.
T. doreensis	*A. doreensis*, C. & V.
T. chrysosoma	*A. chrysosoma*, Blkr.
T. rubropunctata	*A. rubropunctatus*, Rüpp.
T. marginata	*A. marginatus*, C. & V.
T. lineata	*A. lineatus* (Linn.).
T. striata	*A. striatus*, O. & G.
T. sohal	*A. sohal*, Forsk.
T. undulata	*A. undulatus*, C. & V.
T. dussumieri	*A. dussumieri*, C. & V.
T. grammoptila	*A. grammoptilus*, Blkr.
T. cærulea	*A. cæruleus*, Bl. & Schn.
T. lineolata	*A. lineolatus*, C. & V.
T. olivacea	*A. olivaceus*, Bl. & Schn.
T. pyroferus	*A. pyroferus*, Kittlitz.
T. tennentii	*A. tennentii*, Gthr.
T. gahm	*A. gahm*, Forsk.
T. nummifer	*A. nummifer*, C. & V.
T. glaucoparëus	*A. glaucoparëus*, C. & V.
T. celebicus	*A. celebicus*, Bleek.
T. fuscus	*A. fuscus*, Steind.
T. leucosternon	*A. leucosternon*, Benn.
T. achilles	*A. achilles*, Shaw.
T. triangulus	*A. triangulus*, C. & V.
T. fraterculus	*A. fraterculus*, C. & V.
T. bahianus	*A. bahianus*, Castelnau, 1855.

SPECIES ADDED SINCE 1861.

Teuthis aterrima	*Acanthurus aterrimus*, Gthr., 1871.
T. polyzona	*Rhombotides polyzona*, Blkr., 1874.
T. virgata	*Acanthurus virgatus*, V. & S., 1875.
T. cærulea	*Acronurus cæruleatus*, Poey, 1875.
T. bahianus	*Acronurus nigriculus*, Poey, 1875.
T. aurolineata	*Acanthurus aurolineatus*, Day, 1876.
T. munroviæ	*A. munroviæ*, Steind., 1876.
T. plagiata	*A. plagiatus*, Peters, 1876.
	Acronurus formosus, Cast., 1873.
T. blochii	*Acanthurus blochii*, C. & V. (formerly *matoides*, C. & V.), Gthr., 1875.
T. zebra	*A. zebra*, De Vis, 1884.
T. crestonis	*T. crestonis*, Jordan & Starks, 1895.*

* The *Teuthis crestonis* has been described by Jordan and Starks in a memoir on the Fishes of Sinaloa received just before the revised proof of the present communication. It appears therefrom that Dr. Jordan has reverted to the use of *Teuthis* in the sense here defended, as indeed he had previously informed me by letter he would do.

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The following forms have been connected with the name *Teuthis*, viz:

Former names.	Names adopted.
Teuthis hepatus, L., 1758	*Teuthis hepatus.*
T. javus, L., 1758	*Siganus javus.*
T. australis, Gray, 1826	*Teuthis triostegus.*
T. concatenatus (C. & V.), Cantor, 1850	*Siganus concatenatus.*
T. dorsalis (C. & V.), Cantor, 1850	*S. dorsalis.*
T. brevirostris, Gron., 1854	*S. albopunctatus.*
T. tubulosa, Gron., 1854	*S. vulpinus.*
(Names of Günther, 1861.)	
T. javus (L.)	*S. javus.*
T. canaliculata (Park)	*S. canaliculatus.*
T. concatenata (C. & V.)	*S. concatenatus.*
T. corallina (C. & V.)	*S. corallinus.*
T. vermiculata (C. & V.)	*S. vermiculatus.*
T. labyrinthodes (Bleek.)	*S. labyrinthodes.*
T. sutor (C. & V.)	*S. sutor.*
T. margaritifera (C. & V.)	*S. margaritiferus.*
T. tumifrons (C. & V.)	*S. tumifrons.*
T. dorsalis (C. & V.) Cantor	*S. dorsalis.*
T. oramin (Bl. & Schn.) Gthr	*S. oramin.*
T. albopunctata (Schl.)	*S. albopunctatus.*
T. striolata, Gthr	*S. striolatus.*
T. hexagonata (Bleek.)	*S. hexagonatus.*
T. guttata (Bl.)	*S. guttatus.*
T. stellata (Forsk.)	*S. stellatus.*
T. notosticta (Richardson)	*S. notostictus.*
T. fuscescens (Hont.)	*S. fuscescens.*
T. lurida (Rüpp.)	*S. luridus.*
T. nebulosa (Bl. & Schn.)	*S. punctatus?*
T. argentea (Q. & G.)	*S. argenteus.*
T. marmorata (Q. & G.)	*S. marmoratus.*
T. lineata (C. & V.)	*S. lineatus.*
T. sigana (Forsk.)	*S. sigan.*
T. tetrazona (Bleek.)	*S. tetrazona.*
T. doliata (Cuv.)	*S. doliatus.*
T. puella (Schleg.)	*S. puella.*
T. virgata (C. & V.)	*S. virgatus.*
T. vulpina (S. & M.)	*S. vulpinus.*
SPECIES ADDED SINCE 1861.	
Teuthis mertensii? (C. & V.) Kner, 1865	*Siganus mertensii?*
T. oligosticta, Kner, 1868	*S. oligostictus.*
T. rostrata, (C. & V.) Gthr., 1874	*S. rostratus.*
T. studeri, Peters, 1876	*S. studeri.*
T. gibbosus, De Vis, 1884	*S. gibbosus.*
T. teuthopsis, De Vis, 1884	*S. teuthopsis.*
T. flava, De Vis, 1884	*S. flavus.*
T. vitianus, Sauvage, 1886	*S. vitianus.*
T. abhortani, (C. & V.) Sauvage, 1891	*S. abhortani.*

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NOTES ON THE NOMENCLATURE OF SCYMNUS OR SCYMNORHINUS, A GENUS OF SHARKS.

By THEODORE GILL, LL. D.

THE SHARK genus generally known under the name *Scymnus* can not retain that name. To show why it can not and what should be its substitute is the object of the present communication.

I.

The name *Scymnus* was given to the genus of sharks by Cuvier in 1817; the same name had been given by Kugelmann in 1794 to a genus of coccinelloid beetles, and is still in use, the insect genus now comprising very numerous species. Therefore, the use of the appellation in ichthyology is precluded. Several names are available as substitutes.

II.

In 1810 Rafinesque gave the name *Dalatias* to a genus distinguished from his *Squalus* (*Acanthias*) by the alleged absence of spiracles. Our knowledge of the Mediterranean fauna and Rafinesque's descriptions otherwise enable us to identify the two species which he refers to *Dalatias* and to assume that the spiracles must have been present in both of them. The *D. sparophagus* was a *Scymnus;* the *D. nocturnus* a typical *Squalus. Dalatias* of Rafinesque was, therefore, a synonym of *Squalus* of Rafinesque, and the result of a blunder and failure of observation.

III.

In 1839 Swainson adopted the genus "*Dalatias*, Raf." but limited it to *D. nocturnus*, incorporating with the generic diagnosis, characters derived from the specific diagnosis given by Rafinesque (furnished with anterior spines, etc.) of *D. nocturnus.*

IV.

In 1846 Bonaparte first substituted for the name *Scymnus* the new term *Scymnorhinus*, doubtless for the reason that he had ascertained that the coleopterous genus had received the former name before the selachian.

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V.

In 1850 Gray revived the name *Dalatias* for the Scymni, on the ground of priority for the former and not because *Scymnus* was preoccupied.

VI.

I conclude that *Dalatias* was to all intents and purposes a pure synonym of *Squalus*, and the addition of a species of another genus was surely insufficient to affect its character. *Scymnus* would therefore have been available as the first independent name of the shark genus, so called, had it not been already used. Under the circumstances, however, *Dalatias* might have been revived with the modified sense attributed to it by Gray, if its revival had not been precluded by other considerations. But the previous limitation of *Dalatias* by Swainson and substitution of a new name by Bonaparte barred such revival. The name given by Bonaparte must therefore be used for the *Scymni* of Cuvier.

VII.

The following synonymy will give other data respecting the names referred to:

Genus SCYMNORHINUS.

<*Les Leiches* (*Scymnus*), CUVIER, Règne Animal, II, p. 130, 1817; 2d ed., II, p. 392, 1829 (not of Kugelmann, 1794).
<*Scymnorhinus*, BONAPARTE, Cat. Met. Pesci Europei, p. 16, 1846.
<*Dalatias*, GRAY, List Fishes Brit. Mus., I, p. 75, 1851.

We may congratulate ourselves that such a barbarous compound as *Dalatias* (of unknown formation) need not be used. *Scymnorhinus* has the merit of being of classical origin and correct formation, although meaningless[1] as a denominator of generic characteristics.

VIII.

The change of the generic name entails a corresponding change in the name of the family of which the genus is the type. The nomenclature of that family is summarized in the following synonymy:

Family SOMNIOSIDÆ.

<Abtheilung der Haifische, MÜLLER and HENLE, Archiv Naturgesch., 3. Jahrg., I, p. 399, 1837.
<Fourth division of Sharks, MÜLLER and HENLE, Mag. Nat. Hist., n. s., II, p. 88, 1838.
<*Scymni*, MÜLLER and HENLE, Syst. Beschreib. Plagiostomen, p. 91, 1841.
<*Scymnidæ*, ADAMS, Man. Nat. Hist., p. 89, 1854.
<*Scymnidæ*, RICHARDSON, Encycl. Brit., 8th ed., XII, p. 325, 1856.
<*Scymnoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xii, 1859.

[1] Scymnorhinus <σκύμνος, cub or whelp +ῥινη, shark. Why *Scymnus* was applied to beetles is not evident; it may have been given in allusion to their small size.

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<*Scymnoidæ*, GILL, Ann. N. Y. Lyceum Nat. Hist., VII, p. 405, 1862.
<*Scymni*, A. DUMÉRIL, Hist. Nat. Poiss., I, pp. 310, 450, 1865.
<*Spinacidæ*, GÜNTHER, Cat. Fish. Brit. Mus., VIII, pp. 355, 417, 1870.
<*Scymni*, FITZINGER, Sitzungsber. K. Akad. der Wissensch. Wien, LXVII, p. 56, 1873.
<*Somniosidæ*, JORDAN, Man. Vert. An. N. U. S., 5th ed., p. 15, 1888.
<*Spinacidæ*, WOODWARD, Cat. Fossil Fishes Brit. Mus., I, p. 30, 1889.
= *Dalatiidæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 129, 1892.

Subfamily SCYMNORHININÆ.

<*Scymnini*, BONAPARTE, Mem. Soc. Hist. Nat. Neuchatel, II, 1838; Nuovi Annali delle Sci. Nat., II, p. 199, 1838; IV, p. 183, 1840.
<*Dalatiana*, GRAY, List Fish. Brit. Mus., pt. 1, p. 74, 1851.

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NOTES ON THE GENUS CEPHALEUTHERUS OF RAFINESQUE, AND OTHER RAYS WITH ABERRANT PECTORAL FINS (PROPTERYGIA AND HIEROPTERA).

By THEODORE GILL, LL. D.

IN A RECENT article on "The Nomenclature of the Myliobatidæ or Aëtobatidæ," I retained the names *Myliobatis* and *Aëtobatis* with a proviso. Adopting temporarily the views of Agassiz, I remarked:

This, it seems to me, is a perfectly legitimate view and use of the two names. Both names, *Aëtobatus* and *Myliobatis*, might have been retained for different sections of the old genus, if no other considerations had forbidden. Both of those names, however, as President Jordan has reminded me, were anticipated by a name given by Rafinesque in 1810.

CEPHALEUTHERUS.

Rafinesque, in his "Indice d'Ittiologia Siciliana," has the genus *Cephaleutherus* interposed between his *Mobula* (= *Cephaloptera* Dum.) and *Uroxis* (*Trygon* auct.), which, according to Dr. Jordan, is a *Myliobatis*. It is not, however, mentioned by Doderlein in his very full synonyms of the *Myliobatids* of the Mediterranean, and the book in question can not be found. While I have little doubt that Dr. Jordan is correct in his identification, and that the name *Cephaleutherus* should be taken for *Myliobatis*, I defer doing so until I am able to consult the "Indice" or a copy of it. Meanwhile I retain the name *Myliobatis*, but adopt for the family *Aëtobatidæ*.

Since that publication, Dr. Jordan kindly sent me a copy of the description of *Cephaleutherus*, and the "Indice d'Ittiologia Siciliana" was found. These data have compelled me to refuse to adopt *Cephaleutherus* as a substitute for *Myliobatis*, and led me to consider that nominal genus to have been based on a teratologic specimen exhibiting an arrest of development. Rafinesque's description follows:

Gen. *Cephaleutherus*. Capo sciolto, e diviso dall' ale laterali, occhi, e spiragli uniti, e situati al lato del capo, due ale sopra la coda, nessuna alla sua estremità. *Osserv.* Questo genere è rimarchevolissimo, a motivo del carattere che offerisce il suo capo sciolto, il quale è unito all' ale laterali ossiano pettorali, in tutti gli altri generi vicini.

Sp. n. *Cephaleutherus maculatus*. Fulvastro al disopra con delle macchie fosche, bianchiccio al di sotto, capo appuntato, ale laterali anteriori, appuntate, e scabre anteriormente, un ordine di spine sopra la Schiena, e tre sopra la coda, che è acuta. *Osserv.* Hà alcune spine disposte regolarmente sopra il capo, e dietro gli occhi, la bocca è situata sotto il capo, ed in un fosso, e le aperture branchiali sono sotto la

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parte anteriore del corpo, cinque da ogni lato; frà le ale laterali anteriori, à posteteori vi è un appendice quasi digitato alla punta, l' ano è più vicino del capo, che della punta della coda, questa è convessa al disopra, e piana al disotto, e le ale, che porta, sono molto vicine alla sua estremita, approssimate frà esse, e con una spina frà il mezzo.

A free head separated from the pectoral fins, and the lateral eyes and spiracles, are characteristic features of myliobatoid rays, and these attributes have evidently led Dr. Jordan to identify *Cephaleutherus maculatus* with *Myliobatis bovinus*, but other characters assigned to the species are in direct contravention of such an identification. Such are the two dorsal fins (due ala sopra la cauda), the approximation of those fins to the end of the tail (molto vicine alla sua estremità) and to each other (approssimata frà esse), the distinct anterior lobes of the ventrals (frà le ale laterali anteriori e posteriori vi è un appendice quasi digitato alla punta), the pointed snout (capo appuntato), the pectoral fins pointed and scabrous anteriorly (ale laterali anteriori appuntate e scabre anteriormente), the row of spiny bucklers along the middle of the back, the spines elsewhere, and the dark yellowish back with blackish spots (fulvastro al disopra con delle macchie fosche). These (and other characters mentioned) are not shared by Mediterranean Myliobatids, but are by different skates. The ray described by Rafinesque appears indeed to have been a true skate (apparently *Raja clavata*), but the notice of the distinct head indicates that there was something anomalous about it. What, then, was it?

I.

There is a liability in any skate to an arrest of development in the growth of the pectoral fins forward and consequently their continuity with the head, but in most of such cases there is an independent extension forward from the base of the pectorals. Such anomalies have received generic names, *Propterygia* having been proposed for one phase of development and *Hieroptera* for another. An analogous phase was probably manifest in the specimen noticed by Rafinesque, and appears to be noticed in the terms "ale laterali anteriori appuntate e scabre anteriormente," which may be interpreted as referring to pectoral fins pointed forward. In such cases, the head is distinct from the pectorals, and the eyes and spiracles more nearly lateral, although not lateral to the degree manifest in Myliobatids. The anomalies represented by the generic names *Propterygia* and *Hieroptera* were described by Otto and Fleming.

II.

The Propterygia of Otto.—Otto, in 1818, obtained a ray in Scotland (New Haven), and in 1820 described it as a new generic type—*Propterygia hyposticta*. The genus was defined as follows:

Raja; altero pinnarum pectoralium pari ad latera capitis a corpore distincti et in rostrum subacuminatum desinentis; spiracula quinque;[1] cauda brevis absque aculeo.

[1] Zum Unterschied der Sechs bei Cephaloptera. (Sic!)

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The description and figure of Otto represent a skate (*Raia intermedia?*) with pectoral fins distinct from the head, nevertheless with imperfect cephalic appendages.

A similar monstrosity is noticed and figured in Richardson's edition of Yarrell's History of British Fishes,[1] with the caption, "A monstrous thornback maid,"—that is, *Raia clavata*.

III.

The Hieroptera of Fleming.—In 1841, the Reverend Dr. John Fleming gave a "Description of a Species of Skate new to the British Fauna." To him it "appears sufficiently evident that this skate can not be referred to any known British species. The form of the snout, of the ventrals, and of the spines, and the distribution of the latter on the back and tail, furnish satisfactory distinguishing characters. But above all the peculiar anterior prolongation of the pectoral fins, their symmetrical character precluding the notion of monstrosity, justify the belief that it is a new European form, and entitled to be regarded as the type of a new genus, which [he says] I propose to term *Hieroptera* (ἱερος, sacerdos, and πτερου, ala); and I further propose to designate the present species by the trivial name of *Abredonensis*, to mark the particular locality [Aberdeen Bay] where it was first observed. The newest of the modern genera to which it approaches is perhaps the *Propterygia* of Professor Otto, the relationship to which immediately suggested itself to that profound ichthyologist, Professor Agassiz, when [Fleming remarked] I showed him the specimen during the visit with which he favored me in October last (1840). It differs, however, from the *Propterygia* in the condition of the pectorals anteriorly, and in the absence of those lateral processes or finlets which occur on each side of the head opposite to the eyes."

The reverend doctor evidently had some peculiar ideas about monstrosities and their asymmetrical character, and probably such ideas prevented him from recognizing his specimen as the monstrosity which his mind appears to have considered. The *Hieroptera*, however, did denote a monstrosity, apparently representing a still greater arrest of development of the pectoral fins than *Propterygia*, and a complete absence of cephalic fin elements.

Fleming's specimen was apparently a form of *Raia clavata*.

The Hieroptera stage was probably that exemplified by Rafinesque's skate. It was also represented by a specimen described and illustrated by Dr. Louis Bureau in an article "Sur une monstrosite de la Raie estellée, *Raia asterias*,[2] Rond."

[1] Vol. II, p. 584, 1859.

[2] Bull. Soc. Zool. France, XIV, pp. 313–316, 1889.

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IV.

The Propleygia of Gray.—Gray, in 1851, cited the name *Propleygia*, Otto, in the synonymy of the genus *Raja*, but without reference to place of publication or date. *Propleygia* is, of course, merely a slip for *Propterygia*. The statement is made that the nominal genus "is founded on a monstrosity rather frequent among the Rays."

V.

The various names that have been given to the monstrosity, or stages of arrest of development, of the pectoral fins may be combined here:

CEPHALEUTHERUS PHASE.

Cephaleutherus, RAFINESQUE, Indice Ittiol. Sicil., p. 61, 1810.
Hieroptera, FLEMING, Edinburgh New Phil. Journ., XXXI, p. 236, pls. 4, 5, 1841.

PROPTERYGIA PHASE.

Propterygia, OTTO, Nova Acta Acad. Caes. Leop. Car. Nat. Cur., X, p. 111, pls. 5, 6, 1820; Conspectus Animal., 1821 (*fide* Fleming).
Propleygia, OTTO, *fide* Gray, List Fish. Brit. Mus., I, p. 105, 1851 (misprint?).

VI.

The Ictaetus of Rafinesque.—Although *Cephaleutherus*, as has been shown, was not identical with *Myliobatis*, one of Rafinesque's genera was, in all probability. In his "Analyse de la Nature"[1] the name *Ictaetus*, Raf., occurs between *Mobula*, Raf., and *Cephaleutherus*, Raf., and this is doubtless merely a Greek equivalent of "Eagle-ray," a quasi-popular designation of *Myliobatis*. *Ictaetus* is, however, a pure nomen nudum, and can not therefore be revived.

[1] 1815, page 93.

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NOTES ON CHARACINOID FISHES WITH CTENOID SCALES, WITH A DESCRIPTION OF A NEW PSECTROGASTER.

By THEODORE GILL, LL. D.

DURING a recent examination of the Characinoid fishes of the United States National Museum, I found a Curimatine which I at once recognized as related to the long-known *Anodus* or *Curimatus ciliatus*, but which was much slenderer and apparently undescribed. The roughness of the body arrested immediate attention and brought up to my mind a late article by an ichthyologist of deserved eminence calling attention to the presence of ctenoid scales in an African representative of the family as peculiar.

I.

The existence of ctenoid scales in several Characinids has long been recorded. In 1845 Müller and Troschel named one species *Anodus ciliatus*[1] on account of such scales. In 1861 the present writer called attention to their presence in an ally of *Xiphostoma*, and gave the name *Ctenolucius* to commemorate the character.[2] In 1885 Sagemehl referred to the development of ctenoid scales in *Curimatus*, *Xiphostoma* and *Distichodus*.[3] In 1889 Dr. and Mrs. Eigenmann recognized ctenoid scales in some species of typical *Curimati*.[4] Finally, in 1893, Professor Vaillant described and illustrated the squamation of the *Nanæthiops unitæniatus*, from Western Africa.[5] Ctenoid scales have therefore been found to have become developed in representatives of no less than four distinct subfamilies, Curimatinæ, Hydrocyoninæ, Distichodontinæ and Tetragonopterinæ, while most of the members of the three polytypic subfamilies have cycloid scales.[6] It follows that in each case ctenoid

[1] Horæ Ichthyologicæ, I, p. 25, pl. IV, fig. 4 (scale).

[2] A Catalogue of the Fishes of the Eastern Coast of North America, p. 8, 1861.

[3] Morph. Jahrbuch, X, p. 2, 1885.

[4] Various other Curimatines with ctenoid scales have been described by Steindachner and the Eigenmanns.

[5] Bull. Soc. Philomathique de Paris, (8) V, p. 13, 1893.

[6] *Distichodus* is the only representative of the Distichodontinæ.

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scales have been developed independently and in forms by no means closely related. Each of the genera in question manifests peculiarities in the development of the ciliation or ctenoid type.

II.

The new species of Curimatinæ belongs to the genus named *Psectrogaster* by Professor and Mrs. Eigenmann, and may be intercalated in the "Analysis of the Species" recognized[1] by them with the following characters:

a[2]. "Origin of dorsal about equidistant between tip of snout and base of upper caudal fulcra. Origin of ventrals nearer to base of caudal than to tip of snout.

b. Body "rhomboidal, the dorsal and ventral outlines making angles at the origin of the dorsal and of the ventral fins;" scales, 55$\frac{1}{6}$..*rhomboides*.

bb. Body salmoniform, the dorsal and ventral outlines being regularly convex; scales 54–55$\frac{1}{1}$..... *auratus*.

aa. "Origin of dorsal about equidistant from tip of snout and from tip of adipose fin.

c. "Depth ♂ and ♀ about 2$\frac{1}{4}$; Lat. 1. 49–56"..... *amazonicus*.

cc. "Depth ♀ 2$\frac{1}{6}$; scales 56; profile convex ..... *ciliatus*.

Such would be the position of the *P. auratus* on the assumption that the primary characters have already been indicated, but in fact the new species seems to be more differentiated from all the others than any one of them is from the other, and the following analysis would appear to be more nearly expressive of the comparative divergence of the several species:

a. Depth of body 1:2$\frac{1}{6}$–2$\frac{3}{8}$; color "plumbeous above, gradually becoming lighter below; a dusky area...at end of lateral line."[3]

b. Depth 2$\frac{1}{4}$–2$\frac{3}{8}$ ..... *rhomboides*.

bb. Depth 2$\frac{1}{4}$ ..... *amazonicus*.

bbb. Depth 2$\frac{3}{4}$ ♂–2$\frac{1}{6}$ ♀ ..... *ciliatus*.

a. Depth of body 1:2$\frac{1}{4}$; color golden immaculate..... *auratus*.

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[1] A Revision of the Edentulous Genera of Curimatinæ, etc. < Ann. N. Y. Acad. Sci., IV, pp. 409–440, 1889. A most useful summary of our knowledge of the group.

[2] The categories "*a*" and "*aa*" are primarily distinguished by the Eigenmanns by the (*a*) "air bladder extending to origin of anal" contrasted with the (*aa*) "air bladder extending to posterior end of anal," but as there is only a single specimen of the new species, the rules of the Museum preclude dissection to reveal the character in the species now to be described.

[3] The Eigenmanns describe the color only in *P. rhomboides*, but declare that *P. amazonicus* "agrees in almost all respects with *P. rhomboides*," and that the male of *P. ciliatus* "can not be told from specimens of *P. amazonicus*." Müller and Troschel call the color of *P. ciliatus* "metallischen schillernd."

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III.

This new species has been in the collection of the United States National Museum for many years, the single specimen being recorded as collected by Lieutenant Gibbon in Bolivia. The specimen is about 5½ inches long and is in good preservation, except the vertical fins, which are broken. The color is so striking that I experienced doubt whether it was real, but I know of no agency which would produce such a hue, and other specimens collected by the same officer offer nothing peculiar in such respects.

PSECTROGASTER AURATUS, new species.

Depth 1 by 2¾; head 1:3;[1] D. 12;[2] A. 10; P. 15; V. 9.

Body elongate and salmoniform, with the dorsal contour not angulate but convex from axilla of dorsal to nape, and the ventral contour regularly arched from axilla of anal to chin; preventral region transversely convex and postventral keel well defined. Head oblong, with the profile nearly straight and declivous and nearly flat at middle. Eye with narrow anterior and posterior adipose lids, with its vertical diameter less than snout and half the interorbital area. Scales all deeply pectinate, and slightly reflected from the body, largest on the sides of the abdomen, much smaller on the back and nape, and extending on the base of caudal. Dorsal at its first ray midway between tip of snout and base of caudal fulcra. Adipose narrow and rather long. Anal moderate, emarginate. Caudal with extended lobes nearly or quite three times longer than entire median rays and with the inner margins straight or concave. Pectorals nearly reaching to ventrals. Ventrals reaching about two-thirds the way to anal and under first half of dorsal, with root of first ray as near base of caudal as front of eye. Color golden, with rufous suffusion on back and without spots.

P. auratus appears to be the most distinct species of the genus. The coarsely pectinated uplifted scales[3] and the golden color remind one somewhat of a holocentrid.

IV.

Relations of the toothless Curimatines.—A review of the several genera of edentulous Curimatines leads me to believe that they have diverged from a common stock most like *Curimata* but with branchial rakers, and their degrees of divergence may be expressed in the following manner:

[1] The length is exclusive of caudal fin.

[2] The rudimentary first dorsal and anal rays are included.

[3] Mud had been retained on the inner field of some of these scales in the specimen preserved.

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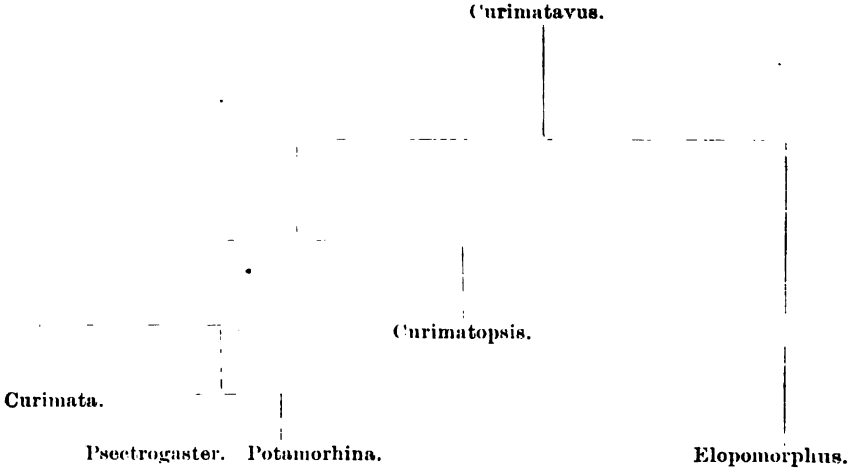
ANALYTICAL KEY TO THE GENERA OF EDENTULOUS CURIMATINES.[1]

a. Gill arches with obsolete or no rakers.
b. Tongue "short and thick," adnate.
c. Postventral region with a median row of scales; scales mostly cycloid. *Curimata*.
c. Postventral region with two lateral overlapping rows of scales; scales pectinate.
d. Preventral region transversely convex and not distinctly limited. *Psectrogaster*.
dd. Preventral "region flat" and bordered on each side by a serrated keel extending from the pectoral to the outer ray of the ventral. *Potamorhina*.
bb. Tongue long and narrow, quite free[2] ..... *Curimatopsis*.
aa. Gill arches with long, slender rakers ..... *Elopomorphus*.

In other terms, while the typical Curimatine series has lost the gill rakers, it has diverged most in other respects from the common progenitors, while *Elopomorphus* has developed gill rakers of increased size and added other striking characters. In a genealogical table the supposed facts may be thus represented:



V.

The chief of the Curimatine genera has been generally called *Curimatus*, but the name should be spelled *Curimata*, as the following early synonymy shows:

[1] For all other characters, see Steindachner, Ich. Beitr., V, p. 34, 1876.

[2] I have accepted the genera and, in several cases, the language of Professor and Mrs. Eigenmann, who, in the analysis of their valuable Revision of the Edentulous Genera of Curimatinæ, have arranged the genera in the following sequence: *Anodus* (= *Elopomorphus*), *Potamorhina*, *Psectrogaster*, *Curimatopsis*, *Curimatus*. Later they adopted the name *Elopomorphus* in place of *Anodus* (Proc. U. S. Nat. Mus., XIV, 1891, p. 46).

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Genus CURIMATA.

<*Curimates*, CUVIER, Mem. Mus. Hist. Nat., I, p. 109 (French name only, unaccompanied by diagnosis or name of type), 1815.
<*Les Curimates*, CUVIER, Règne Animal, II, p. 165, 1817; 2e ed., II, p. 309, 1829.
<*Curimata*, CLOQUET, Dict. Hist. Nat., XII, p. 240, 1818.
<*Curimates*, GOLDFUSS, Hand. Zool., II, p. 24, 1820.
<*Anodus*, AGASSIZ, Sel. Gen. et Sp. Pisc. Brasil., p. 60, 1829.
<*Characinus*, MINDING, Lehrb. Nat. Fische, p. 119,[1] 1832.
<*Curimatus*, VALENCIENNES, Hist. Nat. Poissons, XX, p. 4, etc., 1849.

The type, by elimination, is *C. edentula=cyprinoides*.

[1] Mund wenig gespalten, Zähne klein wie bei den vorigen (i. e., *Choregon* = *Coregonus* + *Thymallus*). *C. curimata* is the only species named.

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THE DIFFERENTIAL CHARACTERS OF CHARACINOID AND ERYTHRINOID FISHES.

By THEODORE GILL, LL. D.

IN MY list of Families and Subfamilies of Fishes (1393) I have admitted two families of Heterognaths, Characidæ (or Characinidæ) and Erythrinidæ. As the limits and concepts of which they are the expressions are quite different from those hitherto current, it is a duty to no longer defer the reasons which have influenced me.

The two families in question have been admitted by other naturalists, but have only been differentiated by the development of an adipose fin in one (Characinids) and the absence of it in the other (Erythrinids). The mere presence or absence of a bag of adipose tissue is, however, of too little importance to justify distinction as a family character, although in most cases it happens to be coordinate with other features, and hence available as a diagnostic mark.[1] Nevertheless, in at least the entire subfamily Stevardiinæ it fails, for the small fishes in question appear to be more nearly related to Tetragonopterines than to Erythrinines. A character of more importance, apparently coordinate with other structural modifications, and which has been the cause of my accepting the two families, is to be found in the structure of the posterior part of the skull. The differences observable in due examination are expressible in the following diagnoses:

Family CHARACINIDÆ.

(*Primary Synonymy.*)

<*Dermoptères*, DUMÉRIL, Zool. Analytique, p. 146, 1806.
<*Salmonidi*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 32, 1810.
<*Dermopteria*, RAFINESQUE, Analyse de la Nature, p. 87, 815.
<*Characini*, MÜLLER, Archiv Naturgesch., 9. Jahrg., I, p. 323, 1843.
<*Characins* (*Characidæ*), AGASSIZ, Rep. Brit. Assn. Adv. Sci., 1844, p. 293.

[1] The development of an adipose fin may occasionally fail as a generic and even specific character, as among the Nannostomi. "Nur bei einer einzigen dieser Arten fehlt..die Fettflosse vollständig; bei einer zweiten Art besitzen von vier Exemplaren drei eine Fettflosse, während sie dem vierten Individuum fehlt" (Steindachner, Ich. Beit., V, p. 74, 1876).

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×*Characins*, VALENCIENNES, Hist. Nat. des Poissons, XXI, p. 159, 1848.
<*Characina*, VOGT, Zool. Briefe, II, p. 150, 1851.
×*Myletidæ*, ADAMS, Man. Nat. Hist., p. 108, 1854.
×*Characinidæ*, RICHARDSON, Encycl. Brit., 8th ed., XII, p. 245, 1856.
×*Characinoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. 31, 1859.
<*Characinidæ*, GÜNTHER, Cat. Fish. Brit. Mus., V, p. 278, 1864.
<*Characinidæ*, COPE, Proc. Am. Assn. Adv. Sci., 1871, p. 333 (1872).
<*Characinidæ*, GILL, Arrang. Fam. Fishes, p. 16, 1872.
<*Citharini*, FITZINGER, Sitzungsber. K. Akad. Wiss. Wien, LXXVII, 1. Abth., p. 37, 1873.
<*Characinida*, SCHMARDA, Zool., II, p. 377, 1878.
<*Characinidæ*, JORDAN and GILBERT, Syn. Fishes N. Amer., p. 254, 1882.
=*Characidæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893.

(*Secondary Synonymy.*)

<*Salmones*, CUVIER, Règne Animal [1e éd.], II, p. 159, 1817; 2e éd., II, p. 301, 1829.
<*Salmonides*, LATREILLE, Fam. Nat. Règne Animal, p. 119, 1825.
<*Salmones*, AGASSIZ, Sel. Gen. et Sp. Piscium q. coll. Spix, p. 56, 1829.
<*Salmonidæ*, BONAPARTE, Giorn. Accad. di Scienze, III, p. 95 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 37), 1832.
<*Salmonidæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 184, 283, 1839.
<*Salmonidæ*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 132, 1838; IV, p. 272, 1840.
<*Characinidæ*, SAGEMEHL, Morph. Jahrb., X, p. 1, etc., 1885.

(*Synonyms of Characininæ.*)

<*Characini*, LATREILLE, Fam. Nat. Règne Animal, p. 119 ("Tribu").
<*Salmonini*, BONAPARTE, Giorn. Accad. di Scienze, LII, 95 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 37), 1832.
<*Salmoninæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 185, 286, 1839.
<*Hydrocyonini*, BONAPARTE, Nuovi Annali delle Sci. Nat., II, p. 132, 1838; IV, p. 273, 1840.
<*Characinini*, BONAPARTE, Cat. Met. Pesci Eur., p. 5, 1846; Conspectus Syst. Piscium, 1850.
<*Leiogastriformes*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxii, 1859.
<*Hydrocyonina*, GÜNTHER, Cat. Fish. Brit. Mus., V, pp. 280, 345, 1864.
<*Hydrocyonina*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893.

Heterognaths with the skull above more or less invaded by reentering valleys from behind, and the supraoccipital having a horizontal extension and carinated by a procurrent crest.

Family ERYTHRINIDÆ.

(*Primary Synonymy.*)

<*Erythröides*, VALENCIENNES, Hist. Nat. Poiss., XIX, p. 480, 1846.
<*Erythrinidæ*, RICHARDSON, Enc. Brit., 8th ed., XII, p. 250, 1856.
<*Erythrinoidei*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxi, 1859.
=*Erythrinidæ*, GILL, Annals Lyc. Nat. Hist. N. Y., VI, p. 410, 1858.
<*Erythrinidæ*, COPE, Proc. Am. Assoc. Adv. Sci. 1871, p. 333 (1872).
<*Erythrini*, FITZINGER, Sitzungsber. K. Akad. Wiss., Wien, LXVII, 1. Abth., p. 37, 1873.
=*Erythrinidæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893

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(*Secondary Synonymy.*)

<*Siagonotes*, DUMÉRIL, 1806.
<*Clupeidæ*, BONAPARTE, 1832–1840.
<*Characini*, MÜLLER et al.
<*Characinidæ*, GÜNTHER et al.

(*Synonyms of Erythrininæ.*)

<*Erythrichthini*, BONAPARTE, Nuovi Annali Sci. Nat., II, p. 132, 1838; IV, p. 196, 1840.
<*Cyprinæ*, SWAINSON, Nat. Hist. and Class. Fishes, etc., II, pp. 184, 283, 1839.
<*Erythrichthini*, BONAPARTE, Trans. Linn. Soc., XVIII, p. 300, 1840–41.
<*Erythrichthini*, BONAPARTE, Cat. Met. Pesci Eur., p. 5, 1846; Cons. Syst. Pisc., 1850.
<*Erythrinina*, GÜNTHER, Cat. Fish. Brit. Mus., V, pp. 278, 281, 1864.
<*Erythriniformes*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxi, 1859.
=*Erythrininæ*, GILL, Mem. Nat. Acad. Sci., VI, p. 131, 1893.

Heterognaths with the skull above more or less truncated behind, and the supraoccipital confined to the posterior surface and carinated by a rudimentary or obsolete vertical crest.

There is good reason to believe that the Characinidæ, as here still preserved, constitute a heterogeneous group, and may hereafter be subdivided into two or more families, but the material at hand is insufficient to confirm the suspicions entertained or to properly refer the species to their respective families. Great differences are observable in the relative development of the jaws, the composition of the lower jaw, the branchial apparatus, etc.[1]

BIBLIOGRAPHY.

The illustrations of the skeletal features of the representatives of the family being much scattered, a list of most of them is here appended. More valuable than all others and accompanied by philosophical views are those given in Sagemehl's Memoir.

GENERAL BIBLIOGRAPHY.

Sagemehl (Dr. M.). Beiträge zur vergleichenden Anatomie der Fische. I–IV. Morph. Jahrbuch, IX–XVII, viz:

I. Das Cranium von Amia calva. IX, pp. 177–228, pl. 10, 1884.
II. Einige Bemerkungen über die Gehirnhäute der Knochenfische. IX, pp. 457–474, pl. 23, 1884.
III. Das Cranium der Characiniden, nebst allgemeinen Bemerkungen über die mit einem Weber'schen Apparat versehenen Physostomenfamilien, X, pp. 1–119, pls. 1, 2, 1885.
IV. Das Cranium der Cyprinoiden. XVII, pp. 489–595, pls. 28, 29, 1891.

[1] According to Sagemehl (III, p. 105, pl. 1, fig. 14), *Citharinus* has the lower jaw composed of only two lateral elements, a greatly elongated articular bone and reduced dentary. These peculiarities are coordinated with other cranial characters and with modifications of the branchial apparatus. *Citharinus* seems therefore to be the type of a peculiar family (Citharinidæ). Of course such a family is very different from that named *Citharini* of Fitzinger, which is the same as Characinidæ. It would also differ much from the subfamily Citharina of Thominot (Bull. Philomath. Soc., (7) VI, p. 250, 1882), which includes the Citharininæ and most of the Curimatinæ, but not the typical genus *Curimata* or the edentulous forms. The genera included by Thominot are *Saccodon*, *Hemiodus*, *Parodon*, *Citharinus*, *Prochilodus* and *Cænotropus*.

BIBLIOGRAPHY OF SPECIES.

Subfamily ERYTHRININÆ.

Erythrinus unitæniatus, SPIX.[1]

Erythrinus unitæniatus, SAGEMEHL, Morph. Jahrb., X, p. 26, pl. 1, figs. 1–12 (skull), 1885; EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 105, pl. 1, fig. 2 (jaws), 1889.

Macrodon tareira, BLOCH.

Macrodon trahira, STEINDACHNER, Denkschr. Akad. Wiss. Wien, XLII (Fisch Cauca, p. 14), pl. 5, fig. 3 (articulation of dentary), 1879.

Macrodon malabaricus, EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 102, pl. 1, fig. 1 (jaws), 1889.

Subfamily PYRRHULININÆ.[2]

Pyrrhulina guttata (STEINDACHNER).

Pyrrhulina guttata, EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 108, pl. 1, fig. 3 (jaws), 1889.

Subfamily LEBIASININÆ.

Lebiasina bimaculata (CUVIER and VALENCIENNES).

Lebiasina bimaculata, EIGENMANN, Proc. Cal. Acad. Sci. (2), II, p. 113, pl. 1, fig. 5 (jaws), 1889.

Subfamily TETRAGONOPTERINÆ.

Tetragonopterus mexicanus, FILIPPI.

Tetragonopterus mexicanus, STEINDACHNER, Sitzungsber. K. Akad. Wiss., Math. Nat. Cl., LX, 1. Abth., p. 300 (Ich. Not., IX), pl. 4, figs. 2–4 (Phar. bones), 1869–70.

Subfamily SERRASALMONINÆ.

Serrasalmo ———.

Serrasalmo ———, ROSENTHAL, Ichthyotom. Tafeln, pl. 6, 1816.

Pygocentrus piraya, LACÉPÈDE.

a. Pygocentrus piraya, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig 5 (br. skel.), 1863.

b. Serrasalmo piraya, KLEIN, Jahreshefte d. Vereins f. Vaterl. Naturk. in Württemberg, 40. Jahrg. (1884), pp. 157, 226, pl. 2, figs. 12, 13; 42. Jahrg. (1886), p. 261, pl. 7, fig. 28; p. 291, pl. 8, fig. 53 (cr. bones).

Myleus.

Myletes ———, GERVAIS, Castelnau's Expéd. dans l'Amérique du Sud, Anat., p. 97, pl 2 (skull), 1856.

Myleus oligacanthus (MÜLLER and TROSCHEL).

Myletes olygacanthus, KLEIN, Jahreshefte d. Vereins f. Vaterl. Naturk. in Württemberg, 40. Jahrg. (1884), pp. 159, 227, pl. 2, figs. 14, 15.

[1] The genus *Erythrinus* (Gronovius, Scopoli) was based exclusively on a species without pterygoid teeth, and consequently the section so distinguished should retain the name instead of *Hetererythrinus*, while the subgenus (or genus) differentiated by the development of pterygoid teeth (typified by *E. unitæniatus*, Spix) may be called *Hoplerythrinus*.

[2] It seems advisable also to direct attention to the *Grundulus* of Valenciennes, referred by that naturalist next to *Hydrargyra* (XVIII, pp. 216–220). It appears to me to be related to *Pyrrhulina*, if not a species of that genus, and therefore a Characinid. Valenciennes himself (XVIII, p. 219) remarked that it cannot be denied that the number of branchiostegal rays and the bilobate air bladder agree with Characin characteristics.

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Subfamily HYDROCYONINÆ.

Hydrocyon forskalii, CUVIER.

Hydrocyon forskali, KLEIN, Jahreshefte d. Vereins f. Vaterl.. Naturk. in Württemberg, 35. Jahrg. (1879), p. 104, pl. 1, fig. 13 (mast.); 40. Jahrg. (1884), p. 156, pl. 2, figs. 10, 11; 41. Jahrg. (1885), pp. 195, 211, pl. 3, figs. 73, 74; 42. Jahrg. (1886), p. 261, pl. 7, fig. 27; p. 291, pl. 8, fig. 52 (cr. bones).

Subfamily MYLETINÆ.[1]

Myletes dentex, LINNÆUS.

Alestes dentex, SAGEMEHL, Morph. Jahrb., X, p. 26, pl. 2, figs. 17, 18 (skull), 1885.

Subfamily DISTICHODONTINÆ.

Distichodus ægyptius, GMELIN.

a. Distichodus niloticus, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig. 6 (br. skel.), 1863..

b. Distichodus kammar, METTENHEIMER, Disq. anat. comp. membro pisc. pect., pl. 2, fig. 12 (sh. girdle), 1847.

Subfamily ANOSTOMINÆ.

Leporinus elongatus, STEINDACHNER.

Leporinus elongatus, STEINDACHNER, Denkschr. K. Akad. Wiss. Wien, Math. Nat. Kl., XXXIX (Fish. Mag., pp. 38, 39), pl. 10, figs. 3–5 (preop. and quadrate), 1878.

Subfamily CURIMATINÆ.

Prochilodus brama, VALENCIENNES.

Prochilodus brama, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig. 3 (br. skel.), 1863.

Subfamily CITHARININÆ.

Citharinus geoffroyi, CUVIER.

Citharinus geoffroi, HYRTL, Denkschriften K. Akad. Wiss. Wien, Math. Nat. Cl., XXI, p. 7, pl. [1], fig. 4 (br. skel.), 1863.—SAGEMEHL, Morph. Jahrb., X, p. 26, etc., pl. 1, fig. 14; pl. 2, figs. 1–11 (skull), 1885.

[1] Myletinæ (or better Mylitinæ), not Myletidini—*μυλιτης, ου*, millstone or grinder.

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NOTES ON ORECTOLOBUS OR CROSSORHINUS, A GENUS OF SHARKS.

By THEODORE GILL, LL. D.

IN 1834, Bonaparte, in the seventh fasciculus of his "Fauna Italica" and in the chapter on *Scyllium canicula*, proposed to divide the genus *Scyllium* into three genera, *Orectolobus*, *Scyllium* and *Pristiurus*. The genus *Orectolobus* was defined in the following terms:

Nell' *Orectolobus*, Nob. (le cui specie sono tutte esotiche); il muso è breve, la bocca prossima all' estremità di quello; il margine delle narici è fornito all' esterno d' una valvula assai lunga, rivolta all' indietro; le aperture branchiali sono picciole, le due posteriori dell' uno e dell' altro lato vicine fra loro e quasi confuse in una; la pinna anale è collocata dietro la seconda dorsale. Questa divisione, che trovasi già accennata nelle opere del Cuvier e del Blainville comprende lo *Squalus barbatus*, Gmel. (*punctatus*, Schneid.), lo *Squalus fasciatus*, Bloch (*tigrinus* e *longicaudus*, Gmel.) e lo *Squalus lobatus*, Schneid.

The species thus included are by no means congeneric, but belong to two widely distinct genera. Both genera in 1837 were distinguished by Müller and Henle in the same paper and named *Stegostoma* and *Crossorhinus*.

The *Squalus fasciatus* was regarded as typical of the genus *Stegostoma* and named *S. fasciatum*.

The *Squalus barbatus* and *S. lobatus* are generally regarded as conspecific, and were united by Müller and Henle under the name *Crossorhinus barbatus*.

The *Squalus* "*punctatus*, Schneid.," identified by Bonaparte with *S. barbatus*, is now considered to be the same as *Ginglymostoma cirratum*.

It is obvious that one or the other of the later names must give place to the earlier *Orectolobus*. The applicability was complicated, however, by Bonaparte himself, who later used *Orectolobus* instead of *Chiloscyllium*. For this usage there appears to be no justification. Bonaparte's action, nevertheless, did not vitiate his previous work, and the name *Orectolobus* had best be revived for the one later called *Crossorhinus*, whose synonymy will then be as follows:

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Genus ORECTOLOBUS.

<*Orectolobus*, BONAPARTE, Fauna Ital., Pesci, 7. fasc., 1834.
=*Crossorhinus*, MÜLLER and HENLE, Archiv Naturgesch., 3. Jahrg., I, p. 396, 1837.
Squalus, sp., BLOCH, SCHNEIDER, et vet.

The subfamily name should then be *Orectolobinæ* and the family name *Orectolobidæ*.

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NOTE ON THE FISHES OF THE GENUS CHARACINUS.

By THEODORE GILL, LL. D.

FOR OVER fifty years the family name *Characini* or *Characinidæ* has been in use, but during all that time no one has used the generic name *Characinus*. The family name, indeed, has remained without a recognized name-giving genus. It is time that the nomenclature should be accordant with the facts, and the object of this note is to resuscitate the long-neglected name.

In 1754 Gronovius took the name *Charax* for two South American fishes, subsequently referred to the genera *Anacyrtus* and *Tetragonopterus*.

In 1758 Linnæus referred the two Gronovian fishes to his genus *Salmo*, and to the section of that genus named *Characini*.

In 1777 Scopoli adopted the genus *Charax* from Gronovius, and thus formally introduced it into the binomial nomenclature.

In 1802 Lacépède adopted the section of Characini as a genus and gave to it the singular form *Characinus*.

It will only be necessary to examine the tenth edition of the "Systema Naturæ" of Linnæus to select the type, but, for the sake of comparison, the species admitted into the twelfth and Gmelin's editions are added.

References to Characini in the tenth, twelfth and thirteenth editions of Linnæus' Systema Naturæ.

	Tenth edition.		Twelfth edition.		Gmelin.		
	Page.	No.	Page.	No.	Page.	No.	
Dentex	(a)	.....	.....	.....	1383	47	Myletes niloticus (1).
Gasteropelecus	.....	.....	.....	.....	1384	48	Gasteropelecus sternicla.
Gibbosus	311	19	513	20	1384	20	Characinus gibbosus (2).
Notatus	.....	.....	513	21	1385	21	Tetragonopterus ——?
Bimaculatus	311	20	513	22	1385	22	Tetragonopterus bimaculatus.
Immaculatus	312	21	513	23	1385	23	(?)
Fœtens	.....	.....	513	24	1385	24	Synodus fœtens (4).
Cyprinoides	.....	.....	514	25	1385	25	Curimata cyprinoides.
Niloticus	312	22	514	26	1386	26	Myletes niloticus (1).
Ægyptius	.....	.....	.....	.....	1386	49	Distichodus ægyptius (6).
Pulverulentus	312	23	514	27	1386	27	Tetragonopterus ——? (7).
Rhombeus	.....	.....	514	28	1386	28	Serrasalmus rhombeus.
Anostomus	312	24	514	29	1387	29	Anostomus anostomus.

a *Myletes niloticus* = *Salmo niloticus* = *Cyprinus dentex*, Linnæus S. N., 10. ed., p. 325; Mus. Ad. Fr., p. 108, 1764. Many would therefore prefer *M. niloticus*.

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It is to be remembered that Gmelin intercalated the species he added to the "Systema Naturæ" according to their supposed affinities, but with the numbers continued from the highest of Linnæus.

The species with numbers after the accepted names require some consideration.

1. The *Myletes niloticus* or *dentex* is the *Alestes kotschyi* (not *dentex*) of Günther, and as it was the only described species for which Cuvier originally[1] framed the genus, it should retain the former generic name. The South American species referred to *Myletes* should take the name *Myleus* of Müller and Troschel. This genus has been divided into two subgenera, *Myletes* and *Myleus*. For the former, *Myloplus* may be taken as a substitute. The classical form *Mylites* (*dentex*) has been used for the typical form by Minding[2], and perhaps will be accepted by purists. The *S. dentex* of Hasselquist, or *S. niloticus* of Forskål, is a different species—*M. hasselquistii*, Cuvier.

2. The *Characinus gibbosus* is *Alestes gibbosus*, Günther, as already indicated.

3. The *Salmo* (*Characinus*) *immaculatus* is at present unidentifiable.

4. The *Synodus fœtens* is *Saurus fœtens* of Günther, and of course has no affinity to the Characinids.

5. The *Curimata cyprinoides* must take that name, as *Curimata* was the first Latin form of the name given.[3]

6. The *Distichodus œgyptius* is *D. niloticus*, Günther. Dr. Günther takes the name from Hasselquist, whose work was published in 1757, but if the precepts of the British and American Associations for the Advancement of Science and other biological societies are adopted, no names behind the tenth edition can be accepted. Dr. Günther, in his synonymy[4] quotes "*Salmo œgyptiacus*, Linnæus, GMELIN, I, p. 1386," but the form used by Linnæus and Gmelin was *S. œgyptius*. As *Ægyptius* was the older and more classical form, it is not obvious why any one should have wished to alter the name to *Ægyptiacus*.

7. The *Salmo* (*Characinus*) *pulverulentus* has never been identified, but was probably a *Tetragonopterus*.

Inasmuch as Linnæus really derived the conception of the genus, as well as the basis of this name, from Gronovius, we should take one of the two species originally referred by that author to his genus *Charax*. Swainson, as early as 1839, revived the Linnæan designation (*Characinus*) for the *C. gibbosus*, and Valenciennes was inclined to adopt the Gronovian name (*Charax*) for the genus, to which he nevertheless

[1] Mem. Mus. Hist. Nat., I, 115, 1815; Règne Animal, II, 66, 1817. Dr. Günther went back for *Myletes* only to Cuvier, Mém. Mus., IV, p. 444, when the South American species attributed to it were first described.

[2] Lehrbuch, p. 121, 1832.

[3] Cloquet, Dict. Hist. Nat., XII, p. 240, 1818.

[4] Cat. Fish. Brit. Mus., V, p. 360.

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applied the name *Epicyrtus*.[1] For that genus, therefore, *Characinus* may be revived.[2]

The species of the tenth edition of the "Systema Naturæ" were referred to new genera in the following sequence:

1777. *Anostomus*, SCOPOLI (ex GRON.).
1815. *Tetragonoptère*, CUVIER.
1815. *Myletes*, CUVIER.
1817. *Les Tetragonoptères* (*Tetragonopterus*, ARTEDI)[3] CUVIER.
1845. *Distichodus*, MÜLLER and TROSCHEL.
1845. *Alestes*, MÜLLER and TROSCHEL = *Characinus* restricted.

Thus by successive eliminations the genus was finally restricted to *C. gibbosus*. Its synonyms are as follows:

Genus CHARACINUS.

Pre-binomial synonyms.

<*Charax*, GRONOVIUS, Mus. Ichth., I, p. 19 (†), 1754.

Binomial synonyms.

<*Characini* (*Salmo* * * *) LINNÆUS, Syst. Nat., 10. ed., p. 311, 1758.
<*Charax*, SCOPOLI, Int. Hist. Nat., p. 455, 1777.
<*Characinus*, LACÉPÈDE, Hist. Nat. Poiss., V, p. 269, 1802.
<*Characinus*, SWAINSON, Nat. Hist. Fish., etc., II, p. 289, 1839 (not of Vol. I).
<*Epicyrtus*, MÜLLER and TROSCHEL, Horæ Ichth., II, p. 17, 1845.
<*Anacyrtus*, GÜNTHER, Cat. Fish. Brit. Mus., V, p. 346, 1864.
<*Cynopotamus*, GARMAN, Bull. Essex Inst., XXII, p. 11, 1890.
=*Anacyrtus*, EIGENMANN, Proc. U. S. Nat. Mus., XIV, p. 57, 1891.
Salmo, sp., LINNÆUS et al.
Piabuques esp., CUVIER, 1817.

The name *Characinus* has been misapplied by at least two naturalists, viz:

Characinus, MINDING, Lehrb. Nat. Fische, p. 119, 1832 (= Curimata).
Characinus, SWAINSON, Nat. Hist. Fishes, I, pp. 241, 255, 259, 1838 (= Curimata).

[1] Cuvier and Valenciennes, XXII, p. 41, 1849.

[2] Some may prefer to take *Charax*, because Linnæus used the plural form Characini for a section not formally designated by him as a subgenus, and I have felt and still feel inclined to adopt it myself.

[3] The generic name *Tetragonopterus* has been erroneously attributed to Artedi, who was too good an ichthyologist to have confounded a *Tetragonopterus* (Cuvier) with a *Tetragonoptrus* (Klein, "Τετραγωνοπτρος, i. e., quadratus aspectu"). Inasmuch as Artedi died in 1735 and the "Missus" in which Klein's name first occurs was published in 1744, we have another good reason for believing that Artedi had nothing to do with the name.

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THE NOMENCLATURE OF RACHICENTRON OR ELACATE, A GENUS OF ACANTHOPTERYGIAN FISHES.

By THEODORE GILL, LL. D.

THE UNIVERSALLY accepted name *Elacate* must unfortunately be supplanted by one entirely unknown to fame, overlooked by all naturalists, and found in no nomenclator. A brief history of the nomenclature of the genus is timely.

In 1814 Dr. Mitchill, of New York, first described, as a new generic type, a fish which he called *Centronotus spinosus*. He specifically designated the genus as "new" and distinguished it by the broad head, distant eyes, prominent lower jaw, and eight dorsal spines, besides other less important characters. It was apparently merely through a coincidence and natural fitness that he gave the same name as Lacépède had previously used for a heterogeneous genus, including the same species as well as the pilot-fish. Nevertheless, the previous use of the name by both Schneider (1801) and Lacépède (1802), precludes the use for the genus of Mitchill.

In 1826 Dr. Kaup treated of the same fish and gave to it the name *Rachycentron typus*. He gave a good diagnosis, erring only in attributing seven rays to the ventral fins. The following abstract will prove this claim:

RACHYCENTRON. GASTEROSTEUS, Linnæus.

"Kennz. der Gattung. Zähne fein und borstenförmig; Kopf plattgedrückt; 7 Kiemenstrahlen. Brustflossen klein; Bauchflossen 7 strahlig. Erste Rückenflosse enthält freye von einander enfernte Stacheln. Zweyte Rückenflosse und die Afterflosse lang, vom Schwanze unterschieden. Schuppen fein."

Diese Gattung hat sehr viel ähnliches mit *Echeneis* und hat nur die freyen Stacheln mit *Centronotus* gemein, die sich durch den zusammengedrückten Körper sehr von dieser untersheidet. Eine Art *Rachycentron typus*.

The identity of the fish with the *Gasterosteus canadus* of Linnæus, the "Motta" of Russel and the "Ceixupira" of Marcgrave, was recognized.

In 1827 Kaup amended the name into *Rachicentron* and expressed his views as to the affinities of the genus in the following terms:

Wegen des plattgedrückten Kopfes, &c., habe ich diese Art, welche fast in allen Meeren verkommt, zu einer eigenen Gattung erhoben, welche am nächsten mit *Tetragonurus* verwandt ist.

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Kaup now further identified the *Scomber niger* of Bloch, *Centronotus gardenii* of Lacépède, and *Centronotus spinosus* of Mitchill with his species.

In 1829 Cuvier first proposed the generic name with the French plural form "*les Élacates*" for the same genus, basing on the "Pedda mottah" the species "*El. motta*," and for the *Centronotus spinosus* substituting the new name "*El. americana*." The "*Ceixupira*" or *Scomber niger* was retained in the same genus with the pilot-fish, as in the first edition, although those names are mere synonyms of the typical *Elacate*, as had been recognized in 1827 by Kaup.

In view of these facts, it will be obvious that adherence to the rules of priority compels us to take up Kaup's name for the genus in question, and for the family name, if the including group RACHICENTRIDÆ should be employed. Those who adhere strictly to rules of priority and will retain all errors and slips because they were in the earliest names, will prefer Rachycentridæ and *Rachycentron*, although the latter was merely a slip in Kaup's original memoir and was speedily corrected. I prefer to regard it as a typographical error and to take the later and correct form.

The history of the nomenclature is epitomized in the following synonymy:

Genus RACHICENTRON.

=*Centronotus*, MITCHILL, Trans. Lit. Phil. Soc. N. Y., I, p. 490, 1814.
=*Rachycentron*, KAUP, Isis, XIX, col. 89, 1826.
=*Rachicentron*, KAUP, Isis, XX, col. 624, 1827.
=*Les Elacates*, CUVIER, Règne Animal, 2. ed.,[1] II, p. 203, 1829.
=*Elacate*, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, p. 328, 1831.
=*Elacate*, SWAINSON, Nat. Hist. Fishes, etc., II, pp. 176, 243, 1839.
<*Meladerma*, SWAINSON, Nat. Hist. Fishes, etc., II, pp. 176, 243, 1839. (Type "*M. nigerrima*"="Pedda mottah.")
Gasterosteus, sp., LINNÆUS et al.
Centronotus, sp., LACÉPÈDE.

The only now recognizable species rejoices in a very large number of names, as the following synonymy will show. This synonymy expresses the general belief of all recent ichthyologists. Nevertheless, it may well be that two or more species have been confounded, and at least a renewed critical and comparative examination of sufficient material is very desirable.

RACHICENTRON CANADUM.

Gasterosteus canadus, LINNÆUS, Syst. Nat., ed. 12, I, p. 491, 1766.
Scomber niger, BLOCH, Ichthyologie, X, p. 48, pl. CCCXXXVII, 1797.
Centronotus gardenii, LACÉPÈDE, Hist. Nat. Poiss., III, pp. 310, 318, 1802.
[*Centronotus*] *niger*, CUVIER, Règne Animal, II, p. 320, 1817.
Centronotus spinosus, MITCHILL, Trans. Lit. Phil. Soc. N. Y., I, p. 490, pl. 3, fig. 9, 1815.

[1] Les Centronotus (Centronotus) sp., Cuvier, Règne Animal, II, p. 321, 1817.

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Rachycentron typus, KAUP, Isis, XIX, col. 89, 1826.
Rachicentron typus, KAUP, Isis, col. 624, 1827.
[*Naucrates*] *niger*, CUVIER, Règne Animal, 2. ed., II, p. 203, 1829.
El[*acate*] *motta*, CUVIER, Règne Animal, 2. ed., II, p. 203, 1829.
El[*acate*] *americana*, CUVIER, Règne Animal, 2. ed., II, p. 203, 1829.
Elacate pondiceriana, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, p. 329, 1831.
Elacate motta, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, p. 332, pl. CCXXXII, 1831.
Elacate malabarica, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, p. 332, 1831.
Elacate atlantica, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, p. 334, pl. CCXXXIII, 1831.
Elacate birittata, CUVIER and VALENCIENNES, Hist. Nat. Poiss., VIII, p. 338, 1831.
Elacate atlantica, SWAINSON, Nat. Hist. and Class. Fishes, II, p. 243, 1839.
Meladerma nigerrima, SWAINSON, Nat. His. and Class. Fishes, II, p. 243, 1839.
Naucrates niger, SWAINSON, Nat. Hist. and Class. Fishes, II, p. 245, 1839.
Elacate canada, DEKAY, N. Y. Fauna, Fishes, p. 113, pl. XXV, fig. 77, 1842.
Elacate falcipinnis, GOSSE, Nat. Soj. Jamaica, p. 208, 1851.
Elacate nigra, GÜNTHER, Cat. Fish. Brit. Mus., II, p. 375, 1860.

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NOTE ON THE NOMENCLATURE OF THE PŒCILIOID FISHES.

By THEODORE GILL, LL.D.

IT IS generally believed that Agassiz was the first to detach the cyprinodonts from the cyprinids. After the publication of my note on the nomenclature, however, I came across an earlier paper by Rudolph Wagner,[1] in which he named ("Cyprinoïdae") and well diagnosed the family; and, singularly enough, this article immediately followed Agassiz's maiden ichthyological contribution, a description of *Cyprinus* [*Barbus*] *uranoscopus*.[2] Agassiz must therefore have been perfectly cognizant of Wagner's article and must be blamed for not having referred to it. Further, Wagner well defined the new family, while Agassiz did not. The differential characters specified by Wagner were as follows:

Die Gattung *Lebias* bildet mit den Gattungen *Poecilia, Fundulus, Cyprinodon* und *Molienesia* Lesueur, wenn sich letztere Gattung durch weitere Untersuchung bestätigen sollte, eine sehr schöne kleine Familie, welche ich die Familie der Cyprinoïden genannt habe, wegen ihrer grossen Verwandtschaft mit den *Cyprinus*-Arten, wovon sie sich jedoch durch die Zähne in dem Ober- und Unterkiefer, durch die Lage der Rücken- und Schwanzflosse und die Zahl der Strahlen der Kiemenhaut unterscheiden.

This statement of differences is supplemented by a correct formal diagnosis in Latin under the name *Cyprinoïdae*, and a synopsis of all the genera and species.

Unfortunately, Wagner gave a name in accordance with a custom to some extent prevalent at his time,[3] but now universally discarded. Con-

[1] Beiträge zur Kenntniss der Gattung *Lebias* Cuvier und der verwandten Gattungen, [etc.] < Isis, XXI, col. 1050-1058, pl. 12, figs. 1-10, 1828.

[2] Beschreibung einer neuen Species aus dem Gattung *Cyprinus*, Linn. < Isis, XXI, col. 1046-1049, pl. 12, fig. 1 (a-d), fig. 2 (a-d), 1828.

[3] As an instance of similar usage the work of Minding (1832) may be cited, wherein the families Clupeoides (p. 78), Cyprinoides (p. 78), Blennioides (pp. 80, 92), Scomberoides (pp. 80, 88, 130), Percoides (p. 87) are named, not because they are typified by the name-giving genera, but because their representatives are like them. The same names are nevertheless given to the families containing the genera. The names are, therefore, descriptive adjectives, and to be considered in connection with the ordinal names, as Apodes malacopterygii clupeoides, Apodes acanthopterygii blennioides and scomberoides, etc.

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sequently the name Pœciliidæ must be retained, as urged in my former article, and even the justification for the retention of the name *Cyprinodontes*, that it was the first used, disappears.

This memoir of Wagner appears to have been generally lost sight of, as no reference to it appears in any work I have examined, among which are Cuvier and Valenciennes, Bonaparte's Catalogo (1846),[1] Von Martens's article, and Günther's Catalogue.

The two nominal new species, however, appear to have been based on the different sexes of the previously described *Cyprinodon fasciatus*, *Lebias lineato-punctata* being a female and *L. sarda* a male. Both forms had 10 anal rays, according to Wagner, a number likewise found by Von Martens, although Dr. Günther only specifies "A. 8 (9)."

I may add that the name "Pœciliidæ" was first revived by me in 1865,[2] but I had for the time overlooked it while preparing the synonymy of the family in 1894.

ADDENDUM.

The foregoing article was presented for publication May 10, 1895, but various causes have entailed delay in publication. Meanwhile a monograph of "The Cyprinodonts," by Mr. S. Garman, has been published as one of the "Memoirs of the Museum of Comparative Zoology."[3] Although dated July, 1895, the memoir was only received by the present author September 17, 1895. Mr. Garman has given an excellent history of the family of Cyprinodonts, and has made known (pp. 14, 15) the long-neglected contribution by Wagner.

As to the name, Mr. Garman remarks (p. 15):

"The word *Cyprinoïdæ* is incorrectly written; etymologically corrected, it is identical with *Cyprinidæ*. It seems to have been Wagner's intention to coin a different word. This is shown both in the form he gives the name as he writes it, and in the reason given for bestowing it, 'wegen ihrer grossen Verwandtschaft mit den Cyprinus-Arten.' As he failed to give a distinct title, it is left for us to adopt the next subsequent applied to the family as such."

The action of Wagner was, it appears to me, deliberate and intentional, and, as shown above, in consonance with limited usage in his day. The words *Cyprinoïdae* and *Cyprinidæ* are not identical; the former is a compound of *Κυπρῖνος* (*cyprinus*) and *εἶδος* (form or appearance), while *Cyprinidæ* is the same main word, with the patronymic termination—*ιδαι* (idæ),—indicating descendants or family, as in the classical names *Arsacidæ*, *Pelopidæ*, *Seleucidæ* and innumerable others. It was on account of the resemblance of the Cyprinodonts to the Cyprinids that Wagner gave the name *Cyprinoïdae*, and he gave a distinctive name

[1] Under *Lebias calaritana* (Cat., p. 25, No. 135), "*L. nigropunctata*, Wagn." is mentioned, and by it is probably meant *L. lineato-punctata*, but *L. sarda* is not referred to.

[2] Can. Nat., n. s., II, p. 258.

[3] Vol. XIX, No. 1.

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because he did not consider them to be of the same family, although like them.

Mr. Garman thinks that the use of the name *Pœciliidæ* is precluded on account of the previous use of the term *Pœcilidæ* by Kirby, in 1837, for a genus of beetles. The two names, however, differ in etymology and form (one having five syllables and two *i*'s, while the other has only four syllables and a single *i*). *Pœciliidæ* is derived from *Pœcilia*, and *Pœcilidae* from *Pœcilus*. Consequently, the two do not conflict, and it can not be said properly that the name *Pœciliidæ* "was preoccupied in insects" (p. 16). Furthermore, it may be added (though not essential to the question) that *Pœcilidæ* is not in use in entomology. Indeed, the genus *Pœcilus*, on which it was based, is now regarded as a mere section or subgenus of *Feronia* (by most European authors) or *Pterostichus* (by most American authors), and is referred to the Harpaline subfamily of the Carabidæ.

The name *Poëcilioidei* of Fitzinger, 1832, was applied to an Umbrid only, as remarked by Garman (p. 15), but simply because *Umbra* was the only genus occurring in Austria; evidently the name was derived from *Poëcilia*, and the group[1] intended to be typified by that genus.

Mr. Garman's views as to the subdivisions of the family are quite similar to my own. In his preliminary synopsis (pp. 18, 19), he adopts the subfamilies *Cyprinodontinæ*, *Pœciliinæ*, *Jenynsiinæ*, *Anablepinæ*, *Gambusiinæ* and *Haplochilinæ*. These have all been given in my "Families and Subfamilies of Fishes," in which article, however, Günther's name *Fundulinæ* is used instead of *Haplochilinæ*, and *Orestiinæ* is further distinguished. Later on (p. 159) Mr. Garman has substituted for *Gambusiinæ* the name *Belonesocinæ* and added two other subfamilies, *Orestiasinæ* and *Nothobranchiinæ*.

I have not hitherto, as a rule, adopted Bleeker's names ending in *ini* for subfamilies, because Bleeker did not give them as subfamily names, but as those of cohorts or stirpes, divisions of his subfamilies for which he used the suffix *formes*. Nevertheless, I am not indisposed to do so, and perhaps Mr. Garman should be followed in taking the Bleekerian names with the modified form *Haplochilinæ* and *Belonesocinæ*. Bleeker's cohorts were, however, very different in limits from the subfamilies *Fundulinæ* and *Gambusiinæ*, Bleeker restricting them respectively to the type genera, while most of the genera of *Fundulinæ* and *Gambusiinæ* were referred to the cohors or stirps *Cyprinodontini*.

[1] Fitzinger gave names ending in *oidei* only to the groups typified by the genera involved in the names. The groups named after the genera with the suffix *oidei* were not ranked as families by Fitzinger, but as groups of genera under families. For example, the *Poëcilioidei* constituted the first group (Gruppe); the *Cyprinoidei* the second group, and the *Salmonoidei* the third group, of what Fitzinger designated as the family *Elliptosomata* (p. 333), while the family *Cylindrosomata* and the group (Gruppe) *Esocoidei* (p. 339) included the pikes. Consequently I have not heretofore included Fitzinger's names in the lists of synonyms of families.

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The subfamily Orestiinæ or Orestiasini[1] is of very doubtful validity, and in view of the discovery of *Empetrichthys* and the existence of *Tellia* and an apodal *Cyprinodon*, I am disposed to relegate the representative genus to the subfamily *Fundulinæ* or *Haplochilinæ*.

I can not close this addendum without testifying my admiration of the knowledge of the literature of the subject manifested in Mr. Garman's monograph.[2] The work will be of great value, but it will be wished by many, who will have occasion to use it, that he had given in the form of analytical synopses or diagnoses, the benefit of his experience and his views as to the relationships and essential characteristics of the species of polymorphic genera; thereby the wearisome task of identifying specimens would have been much diminished.

[1]The more correct form for the sub-family name would be *Orestiadinæ* (<ὀρεστιάς, άδος).

[2]One of the extremely few works bearing on the subject not included in the "Literature" of Mr. Garman's monograph is Minding's "Lehrbuch der Naturgeschichte der Fische" above referred to. It may be well also to add here that the article attributed to JANOS would be rather looked for under KÁROLI, the former being a Christian name, the Hungarian equivalent of John. Mr. Garman evidently allowed himself to be misled by the custom of the Hungarians of putting the family name first and the Christian name last.

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THE NOMENCLATURE OF THE FISHES OF THE CHARACINOID GENUS TETRAGONOPTERUS.

By THEODORE GILL, LL. D.

THE PRINCIPAL genus of Characinids has been generally ascribed to Artedi, with the name *Tetragonopterus*. The history is a remarkable one and worthy of detail.

I.

In 1814 Cuvier, in his "Mémoire sur la Composition de la Mâchoire supérieure des Poissons," called attention to the diversities among the "Characins," and outlined the characteristics of *Tetragonopterus* in the following terms:

Je rétablis le genre *tétragonoptère* de Séba, dont on a mal à propos confondu l'espèce avec le *salmo bimaculatus;* il a la même structure de mâchoires que le *serrasalme*, mais il porte deux rangs de dents à la supérieure, et son ventre n'est point tranchant ni dentelé.

In 1817 Cuvier, in his Règne Animal,[1] gave the Latin name *Tetragonopterus*, and attributed it to Artedi.[2]

In 1818 Cuvier, in his memoir "Sur les poissons du sous-genre Mylètes"[3] remarked as follows:

Mon deuxième sous-genre * * * a été parfaitement décrit et représenté par Artedi dans ses *Species*, pag. 44, sous le nom de *Coregonus amboinensis*, et dans le cabinet de Séba, tome III, pl. XXXIV, fig. 3, sous le nom générique de *tetragonopterus* que je lui conserve. Cependent Artedi le lui avoit donné par erreur, croyant que ce poisson pouvoit se rapporter aux tétragonoptères de Klein, lesquels ne sont que des chætodons.

In 1864 Günther attributed the genus *Tetragonopterus* to Cuvier[4] and gave the following note:

Klein formed the name *Tetragonoptrus* for fishes of the Linnæan genus *Tetrodon*, giving at the same time an etymological explanation of the word. Artedi afterwards referred a South American characinoid to the Kleinian genus, preserving the original and correct spelling. Cuvier, taking Artedi's species as the type of the genus, adopted the name erroneously used by Artedi, but, misunderstanding the derivation of the word, wrote *Tetragonopterus*.

[1] Vol. III, p. 166.
[2] *Les Tétragonoptères.* (*Tetragonopterus*, Artedi.)
[3] Mem. Mus., IV, p. 455.
[4] "Mem. Mus., 1818, IV, p. 455".

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The name *Tetragonopterus* has been almost universally attributed to Artedi by other authors. Nevertheless, Artedi had nothing to do with the particular description in Séba's work;[1] Artedi was drowned (in 1735)[2] many years before the "missus quartus" with Klein's name was published (1744); the name *Tetragonopterus* was due to a *lapsus oculi* of Cuvier and never appeared in that form till 1815; and the name *Tetragonoptrus* was imagined by Klein for compressed quadrate or rhombiform fishes,[3] such as Chætodonts and the like, and had nothing to do with "Tetrodon," whose species were referred by Klein to his genus *Crayracion*.[4]

II.

In 1758 the third volume of Séba's "Locupletissimi rerum naturalium Thesauri Accurata Descriptio" was published, and on plate 34, fig. 3, was depicted, and on page 106 was described a fish of the genus now named *Tetragonopterus*. The species was called "*Tetragonoptrus argenteus, capite grandi, exserto; appendicula membranacea in extremo dorso; cauda multum bifurca.*" It appeared to the describer to belong to the genus *Tetragonoptrus* of Klein ("Ad genus *Tetragonoptrum* Kleinianum pertinere videtur pisciculus admodum concinnus, quem exemplum Musei Sebani curate delineatum, ac dein ex icone descriptum exhibemus"). An extended description follows. The description is that of one unfamiliar with fishes, and as much unlike the manner of Artedi as is the reference of the species to a genus composed mainly of Chætodontids and related fishes.[5] References to Artedi are given in a preceding paragraph[6] and in other pages, but the paragraphs were evidently from a later hand and less informed mind; nevertheless it is quite probable that Artedi actually had examined a specimen of the same species and described it.

[1] I am, of course, acquainted with the statement of Cuvier and Valenciennes (I, 109): "le texte avait été préparé dès 1734 et 1735 par Artedi, quoiqui l'ait pu être livré au public qu'en 1758, aux frais et par soins de Guabius." The statement is only partly true.

[2] "Die vigesima septima Septembris 1735, vocatur ex hospitio suo, et cum Seba cœnam sumeret, confabulantur amici plures in seram noctem, tandem lætus & contentus valedicit, domum tendens per tenibricosas minusqui ipsi cognitas plateas Amstelædamenses, dum infelici passu fossam intrat, decidit, clamat, frustra opem petit, submergitus, perit." (Linnæus in "Vita Authoris" prefixed to Artedi) Ichthyologia, 1738.

[3] Τετραγωνοπτρος, *i. e.*, quadratus aspectu.

[4] Dr. Günther's substitution of *Tetrodon* for *Chætodon* was the result of following Valenciennes. The French naturalist (Vol. XXII, p. 126), referring to Cuvier's use of the *Tetragonopterus*, added, "Il a aussi eu soin de remarquer, dans ce mémoire, qu' Artedi lui avait donné par erreur la dénomination de Tétragonoptères de Klein, qui ne sont autres que les Tétrodons de Linne." *Tetrodon* was doubtless a heteropheme for *Chætodon*.

[5] *Tetragonoptrus* also included Pomacentrids, vomerine Carangids, etc.

[6] Pisciculus elegans ad *Balistas* Artedi, aut ad *Capriscos* Kleinii, pertinere videtur. Seba's "Locupletissimi rerum naturalium Thesauri Accurata Descriptio" (p. 106).

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III.

In 1735 (published in 1738) Artedi prepared a description of a fish evidently closely related and apparently conspecific with the fish figured in Séba's "Thesaurus" and called it *Coregonus amboinensis*. The only indication of locality was embodied in the sentence "*Coregonoides vel Albula ad Amboinam Indiæ Orientalis.*" Of course, the alleged habitat is incorrect. No information as to the museum in which he saw the specimen was given. The fish could not have been the same as Séba's, for Artedi's individual was 3 inches long and 1 inch and 5 lines high, while Séba's was 3 inches and 6 lines long and 1 inch and 9 lines high. Valenciennes asserted that the type was in the old Museum of the Stadholder, and claimed to have seen it.[1] He has not indicated, however, how he ascertained that such was the case. Dr. Günther[2] has expressed the opinion that "it is quite evident that it [*T. artedii*, Valenciennes] is not the species examined by Artedi and figured by Séba, which agrees in every respect with *T. chalceus*."

IV.

The early history of the genus is recapitulated in the following synonymy:

Genus TETRAGONOPTERUS, Cuvier.

Coregonus, sp., ARTEDI.
Tetragonoptrus, sp., SÉBA.
Tetragonoptère, CUVIER, Mem. Mus. Hist. Nat., I, p. 114, 1815.
Les tétragonoptères (*Tetragonopterus*), CUVIER, Règne Animal, II, p. 166, 1817.
Tetragonopterus, CUVIER, Mem. Mus. Hist. Nat., IV, p. 455, 1818.

Since the preceding article was presented for publication, an important analytical synopsis of the genus *Tetragonopterus* has been published by Prof. Albert B. Ulrey. Professor Ulrey quite correctly refers the generic name to Cuvier, and in the synonymy of the genus omits all reference to Seba's and Artedi's works. In his synonymy of *T. argenteus* (p. 277), however, he refers to it—*Tetragonopterus argenteus*, etc., Artedi, in Seba, [etc.]—and identifies the *Coregonus* (misprinted *Daregonus*) *amboinensis* of Artedi with the same.

It is to be hoped that hereafter all association of Artedi with the name *Tetragonopterus* or with the *Tetragonoptrus* of Seba's work, will be abandoned. Artedi had nothing to do with either of those names.

The analytical synopsis of Professor Ulrey will prove a valuable adjunct to students of the genus *Tetragonopterus*, but it must be used with caution, for it appears to have been based to a large extent on descriptions and figures. Just one hundred species of *Tetragonopterus* are admitted by Professor Ulrey, but only eighty-six have been sufficiently described for admission in the synoptical tables.

[1] Comme j'ai sous les yeux, dans les collections du Muséum, un des Tétragonoptères du cabinet du Stathouder, qui a servi aux travaux d'Artedi, je suis à même de reconnaitre la figure peu correcte que nous trouvons dans Séba (XXVI, 128).

[2] Cat. Fish. Brit. Mus., IV, p. 319.

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LIST OF THE LEPIDOPTERA COLLECTED IN EASTERN AFRICA BY DR. W. L. ABBOTT, WITH DESCRIPTIONS OF SOME APPARENTLY NEW SPECIES.

By W. J. HOLLAND, Ph. D.

THE collection of Lepidoptera referred to me for determination from the U. S. National Museum, contains ninety-one species of Rhopalocera and forty-six species of Heterocera. They had all been pinned and expanded at the National Museum, and a small ticket with the word Zanzibar written upon it affixed to the pins in most cases. In a few cases there was in addition a label in another handwriting, presumably that of Dr. Abbott, giving information as to the exact locality from which certain specimens came. An examination renders it probable that these latter labels are clipped from the envelopes in which the insects were originally packed. In a number of instances it is plain that instead of having come from Zanzibar or its immediate vicinity, as the small labels affixed at the Museum would indicate, they must have come from the interior, and from a relatively high altitude above the level of the sea. The collection contains only a small number of species new to science, the great majority being species well known from other localities, and noticeably from temperate South Africa, many of them species named in the last century. The presence of an *Argynnis* and a *Chrysophanus* in the collection is peculiarly interesting, and suggests to the student the thought that when a more thorough exploration of the lofty heights of Kilimanjaro, Kenia and Ruwenzori shall have been made, there will be some very remarkable, if not astonishing, facts brought to light as to the geographical distribution of animals.

Suborder RHOPALOCERA.

Family NYMPHALIDÆ, Swainson.

Genus DANAIS, Latreille.

DANAIS CHRYSIPPUS, Linnæus, var. KLUGII, Butler.

Limnas klugii, BUTLER, Proc. Zool. Soc. Lond., 1885, p. 758.
Euplœa dorippus, var. *klugii*, KLUG, Symb. Phys., pl. XLVIII, fig. 5.

There are two females and one male specimen of this species in the collection. The females differ in size, and the larger example exceeds

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in expanse of wing the average-sized specimens in the writer's collection from the vicinity of Aden and from Mamboia-land. The smaller of the two females is labeled "Taveta, January, 1889".

DANAIS PETIVERANA, Doubleday.

Danais limniace, CRAMER, var. *Petiverana*, DOUBLEDAY and HEWITSON, Gen. Diurn. Lep., p. 93, pl. XII, fig. 1 (1847).

Danais leonora, BUTLER, Proc. Zool. Soc. Lond., 1862, p. 51; Lepid. Exot., p. 53, pl. XX, fig. 2.

There is but one example of this species, a male, in the collection. It does not differ in the least from examples taken upon the western coast of Africa.

Genus AMAURIS, Hübner.

AMAURIS DOMINICANUS, Trimen.

Danais niavius (LINNÆUS), var., TRIMEN, Trans. Linn. Soc., XXVI, pp. 511, 521, pl. XLII, fig. 6 (♂) (1869).

Amauris dominicanus, TRIMEN, Trans. Ent. Soc. Lond., 1879, p. 323; South African Butterflies, I, p. 61 (1887).

There are two specimens of this species, both males, and both rather smaller than typical examples from Natal, otherwise not differing at all. There is no clue to the exact locality from which the specimens came, but Gerstæcker [1] gives Mombasa as one of the localities of the species, and it is therefore probable that they were taken somewhere in the hot lowlands. The genus is best represented in the hottest parts of tropical West Africa.

Subfamily SATYRINÆ, Bates.

Genus MELANITIS, Fabricius.

MELANITIS LEDA, Linnæus, var. SOLANDRA, Fabricius.

Papilio leda, LINNÆUS, Syst. Nat., I, 2, p. 773, n. 151 (1767).

Papilio solandra, FABRICIUS, Syst. Ent., p. 500, No. 244 (1775).

Two specimens, in nothing differing from examples taken upon the Congo and the Ogové.

Genus MYCALESIS, Hübner.

MYCALESIS SAFITZA, Hewitson.

Mycalesis safitza, HEWITSON, Gen. Diurn. Lep., p. 394, n. 10, pl. LXVI, fig. 3 (1851); Exot. Butt., III, p. 80, pl. XL, fig. 4 (1862).—TRIMEN, S. African Butt., I, p. 105.

Mycalesis eusirus, HOPFFER, Monatsber. d. K. Akad. Wiss., Berl., 1855, p. 641, n. 13, and Peter's Reise n. Mossamb., Ins., p. 393, pl. XXV, figs. 3, 4.

There is one example of the male of this species closely agreeing with Hopffer's description and figure of *M. eusirus*, the proofs of the identity of which with *M. safitza*, Hewitson, Mr. Trimen has most forcibly presented in his recent work upon the South African butterflies.

[1] Gliederthier Fauna des Sansibar-Gebietes, p. 367.

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MYCALESIS SAFITZA, Hewitson, var. EVENUS, Hopffer.

Mycalesis evenus, HOPFFER, Monatsber. d. K. Akad. Wiss., Berl., 1855, p. 641, n. 14; p. 394, pl. XXV, figs. 5, 6 (1862).

There is a good female of the *Evenus* variety in the collection.

MYCALESIS PERSPICUA, Trimen.

Mycalesis perspicua, TRIMEN, Trans. Ent. Soc. London, 1873, p. 104, pl. I, fig. 3.

The collection contains a beautiful male specimen of this well-marked species.

MYCALESIS SANAOS, Hewitson.

Mycalesis sanaos, HEWITSON, Ex. Butt., III, pl. VI, fig. 34.

The collection contains one example of the male, which does not differ materially from specimens coming from Gaboon and the Gold Coast.

Subfamily ACRÆINÆ.

Genus ACRÆA, Fabricius.

ACRÆA CERASA, Hewitson.

Acræa cerasa, HEWITSON, Exot. Butt., II, pl. XX, fig. 10 (1861).—TRIMEN, South African Butt., I, p. 139 (1887).

Three specimens, rather smaller than the average.

ACRÆA INSIGNIS, Distant.

Acræa insignis, DISTANT, Proc. Zool. Soc. Lond., 1880, p. 184, pl. XIX, fig. 6.
Acræa buxtoni, HEWITSON (nec Butler), Ent. Mon. Mag., XIV, p. 155.
Acræa balbina, OBERTHÜR, Etudes d'Ent., XII, p. 6, pl. III, fig. 8.

The National Museum collection contains seven specimens of this very pretty species, all of them of the form mentioned by the author of the species, in which the black spots upon the secondaries are fused into one large spot.

ACRÆA SGANZINI, Boisduval.

Acræa sganzini, BOISDUVAL, Faune Madgr., p. 34, No. 10, pl. VI, figs. 6, 7 (1833).

There are a number of fairly good specimens of this species. A slight variety of this species has just been described by M. Vuillot, of Paris, under the name *A. usugaræ*, and has been marketed in quantity by Dr. Staudinger, of Dresden. One or two of the specimens agree with the form *Usugaræ*, being slightly lighter in the ground color than typical *A. sganzini*, and having the spots less developed.

ACRÆA SERENA, Fabricius.

Papilio serena, FABRICIUS, Syst. Ent., p. 461, n. 76 (1775).

The specimens of this species contained in the collection differ from the common form found upon the west coast, in that the dark transverse

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subapical band does not extend in them to the border of the outer margin and unite with it. Otherwise I can see no difference. The specimens are labeled "Kilimanjaro, 5,000 feet."

ACRÆA CABIRA, Hopffer.

Acræa cabira, HOPFFER, Monatsber. d. K. Akad. d. Wiss. Berlin, 1855, p. 640, No. 7; Pet. Reise, Zool., V, p. 378, pl 23, figs. 14, 15 (1862).

Several good specimens from Kilimanjaro.

ACRÆA PHARSALOIDES, new species.

(Plate VII, fig. 3.)

Agrees with *A. pharsalus*, Ward, in size and in the disposition of the spots upon the upper and lower surfaces of the wings, save that the transapical band of the primaries is fulvous and entirely without white markings, and the spot at the end of the cell of the primaries coalesces with the large quadrate spot which bounds this band internally, forming a very large black spot extending from the costa to the second submedian nervule. The general color of the upper surface is bright fulvous, whereas in *A. pharsalus* it is fuscous. There is one female specimen in the National Museum collection. This may be merely a local race of *A. pharsalus*.

Locality.—Kilimanjaro.

ACRÆA MINIMA, new species.

Allied to *Eponina*, Cramer, but from one-fourth to one-third smaller in size. The upper side of the wings is deep black, with a subapical crimson spot as in *Eponina*, and with the discal area of both wings traversed by a broad band of the same color. The inner edge of this band upon both wings is nearly straight, and forms a continuous line from near the outer extremity of the cell of the primaries to about the middle of the inner margin of the secondaries. The cell of the primaries is not traversed longitudinally by a ray of scarlet fusing with the discal band as in *Eponina*. The outer margin of the scarlet band upon the secondaries is produced opposite the extremity of the cell, and gives the band a strongly angulated appearance. Upon the under side of the wings the scarlet of the subapical spot of the primaries and of the entire secondaries is replaced by ocher-yellow, while the scarlet of the discal band of the primaries reappears upon the lower side, though not as vivid in tone as upon the upper surface, and extends inwardly quite to the base of the wing. The secondaries are ornamented just before the base by a diagonal row of very black spots more or less fused together and forming a narrow band. Upon the outer margin on the interspaces there are seven small triangular white spots. In some specimens a similar spot appears near the outer angle of the primaries.

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Female.—In the case of the solitary female in the collection, the under side of the secondaries from the basal band of spots outwardly to the margin is broadly suffused with fuscous. Whether this is a constant feature of this sex, it is impossible to say without more material at command. It has the appearance to the writer of being a case of aberrant melanism rather than as the normal coloration, but until we know more of the species it will not be safe to make any positive affirmations.

Expanse of wings: male, 27-32 mm.; female, 36 mm.

There are seven males and one female of this very pretty little species in the National Museum collection.[1]

ACRÆA NATALICA, Boisduval.

Acræa natalica, BOISDUVAL, App. Voy. de Deleg. dans l'Afr. Austr., p. 590, n. 57 (1847).

There are seven males and three females in the collection, and they do not differ materially from specimens from the region of the Cape, except that the females are more or less suffused with whitish upon the upper surface of the disks of the secondaries. Collected at Taveta.

ACRÆA EGINA, Cramer.

Papilio egina, CRAMER, Pap. Exot., I, pl. 39, figs. F, G (1776).

One male example, the antennæ of which have been lost.

ACRÆA JOHNSTONI, Godman.

Acræa johnstoni, GODMAN, Proc. Zool. Soc. Lond., 1885, p. 537.—BUTLER, Proc. Zool. Soc. Lond., 1888, p. 91.

There are two pairs of this beautiful insect in the collection.

ACRÆA ABBOTTII, new species.

(Plate VII, fig. 1.)

Allied in some particulars to *A. cabira*, Hopffer, but widely different.

Male.—Upper side: Anterior wings pale ochreous, with the base, the cell, except a small triangular space at its lower edge near its outer end, the costal margin, the apex, and the outer margin broadly black. The ground color is disposed in the form of an oval subapical spot and a broad discal band parallel to the outer margin. The inner margin of the black apical area is minutely excised just above the origin of the second median nervule, and just below there is a round black spot. The black of the basal part of the wing is extended in the form of a narrow streak for a short distance between the median and the

[1] This species is identical with *A. planesium*, Oberthür, Etudes d'Entom., XVII, p. 24, pl. 1, fig. 11; cf. Ann. and Mag. Nat. Hist., October, 1893, p. 24 .

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submedian nerves. The secondaries are broadly pale ochreous, of the same tint as the primaries, with the outer margin broadly and evenly bordered with black. There is a small black spot on the costa near the base, and another near its middle, followed beneath by two minute spots, the three forming a short transverse series. Under side: The base, the costal margin, and the outer margin of the primaries are grayish fuscous. The nervules at their extremities are shaded with blackish, and between them there is a series of marginal greenish ochreous triangular spots, the apices of which pointing inwardly are surmounted each with a short blackish ray or dash. A narrow black line crosses the cell near its middle, and at its end there is a broad subapical bar of black, which extends from the costa, where it is widest, about two-thirds of the distance to the outer margin, and is slightly excised upon its inner margin. The secondaries are bordered with black as upon the upper surface, and have a marginal series of whitish triangular spots upon the interspaces, and a few small black spots near the base, viz: upon the costa, one at the base, one just beyond it, and one at the middle; one in the middle of the cell, and five or six quite small ones disposed in a semicircular series near the middle of the inner margin. The body is black, spotted with yellow; the antennæ are black. The lower side of the palpi and of the thorax and abdomen are pale gray.

Female.—The female does not differ materially from the male, except that upon the upper side there is an additional black spot situated between the submedian and first median nervule, and the small spots upon the costal area of the secondaries are obsolete except the two immediately upon the costa. The under side is as in the male, with the exception of the presence of the additional spot between the submedian and the first median nervule.

Expanse of wings: Male, 38 mm.; female, 45 mm.

The National Museum collection contains one male and two females, one of which is lighter upon the under side than the other.

Family NYMPHALINÆ, Bates.

Genus LACHNOPTERA, Doubleday.

LACHNOPTERA AYRESII, Trimen, var. ABBOTTII, new variety.

Female.—Differs from typical *L. ayresii*, Trimen[1], in having the under side of both wings broadly tinged with lilac instead of "brassy greenish." In other respects it appears to be very much as the South African insect except that the markings are somewhat more distinct.

The National Museum collection contains one slightly damaged female of this interesting form.

[1] South African Butterflies, I, p. 197.

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Genus ARGYNNIS, Fabricius.

ARGYNNIS HANNINGTONI, Elwes.

(Plate VII, fig. 2).

Argynnis hanningtoni, ELWES, Trans. Ent. Soc. Lond., 1889, p. 558.

The collection contains six males and three females, in good condition. There is no clue to their habitat, but as *A. hanningtoni* came from Taveta, it is highly probable that these specimens came from the same region.

Genus HYPANARTIA, Hübner.

HYPANARTIA HIPPOMENE, Hübner.

Hypanartia hippomene, HÜBNER, Sammlung Exot. Schmetter., 1816–1824.

Two defective specimens of this species.

Genus PYRAMEIS, Hübner.

PYRAMEIS CARDUI (Linnæus).

Papilio cardui, LINNÆUS, Faun. Suec., p. 276, n. 1054 (1761).

Two examples of this, the most cosmopolitan of all butterflies.

Genus JUNONIA, Hübner.

JUNONIA CEBRENE, Trimen.

Junonia cebrene, TRIMEN, Trans. Ent. Soc. Lond., 1870, p. 353; S. Afr. Butt., I, p. 210.

One female.

JUNONIA CLELIA (Cramer).

Papilio clelia, CRAMER, Pap. Exot., I, pl. XXI, figs. E, F (1779).

Four males and five females, Taveta.

JUNONIA BOÖPIS, Trimen.

Junonia boöpis, TRIMEN, Trans. Ent. Soc. Lond., 1879, p. 331; S. Afr. Butt. I, p. 217.

Two examples of this form, which is very doubtfully distinct from *J. orithyia*, Linnæus.

Genus PRECIS, Hübner.

PRECIS CLOANTHA (Cramer).

Papilio cloantha, CRAMER, Pap. Exot., III, pl. CCCXXXVIII, figs. A, B (1782).

There is one example of the female sex of this species in the collection.

PRECIS CERYNE (Boisduval).

Salamis ceryne, BOISDUVAL, App. Voy. de Deleg., p. 592, n. 68 (1847).

There is a damaged specimen of the male of this species.

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PRECIS SESAMUS, Trimen.

Precis sesamus, TRIMEN, S. Afr. Butt., I, p. 231 (1887).

There are two specimens of this form to which Mr. Trimen has given the foregoing specific name, separating it from *P. amestris*, Boisduval, with which it has hitherto been always associated in collections.

Locality.—Kilimanjaro.

PRECIS ELGIVA (Hewitson).

Junonia elgiva, HEWITSON, Exot. Butt., III, pl. 13, fig. 1 (1864).

There is a solitary male of this species.

PRECIS NATALICA, Felder.

Precis natalica, FELDER, Wien. Ent. Mon., IV, p. 106 (1860).

One female example in poor condition.

PRECIS SOPHIA (Fabricius).

Papilio sophia, FABRICIUS, Ent. Syst., III, 1, p. 248, No. 771 (1793).

There are three specimens of this species, two females of the pale form, which seems to be most common on the eastern coast and in the interior, and is rarely found upon the western coast.

Genus EURYTELA, Boisduval.

EURYTELA HIARBAS (Drury).

Papilio hiarbas, DRURY, Ill. Exot. Ent., III, pl. 14, figs. 1, 2 (1772).

Three good specimens.

EURYTELA DRYOPE (Cramer).

Papilio dryope, CRAMER, Pap. Exot., pl. LXXVIII, figs. E, F (1779).

Three good examples of this species, the coloring of the outer limbal fascia of which is rather brighter fulvous red than in examples from the region of the Cape and Angola.

EURYTELA OPHIONE (Cramer).

Papilio ophione, CRAMER, Pap. Exot., II, pl. CXIV, figs. E, F (1779).

Six examples quite like those from the west coast.

Genus HYPANIS, Boisduval.

HYPANIS ILITHYIA (Drury).

Papilio ilithyia, DRURY, Ill. Exot. Ent., II, pl. XVII, figs. 1, 2 (1773).

The collection contains two males and five females, all of them differing slightly from each other, and illustrating the remarkable variability of the species.

Locality.—Taveta.

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Genus HYPOLIMNAS, Hübner.

HYPOLIMNAS MISIPPUS (Linnæus).

Papilio misippus, LINNÆUS, Mus. Ulr., p. 264 (1764).

Three males and one female of the typical form, which mimics *Danais chrysippus*, Linnæus.

Locality.—Taveta.

Genus NEPTIS, Fabricius.

NEPTIS MELICERTA (Drury).

Papilio melicerta, DRURY, Ill. Exot. Ent., II, pl. XIX, figs. 3, 4 (1773).

Two examples.

Genus EUPHÆDRA, Hübner.

EUPHÆDRA NEOPHRON (Hopffer).

Romaleosoma neophron, HOPFFER, Monatsber. d. K. Akad. d. Wiss. Berlin, 1855, p. 640.

There is one good example of this species, which is widely distributed upon the eastern coast of Africa.

Genus HAMANUMIDA, Hübner.

HAMANUMIDA DÆDALUS (Fabricius).

Papilio dædalus, FABRICIUS, Syst. Ent., p. 482, n. 174 (1775).

One finely preserved specimen.

Genus PALLA, Hübner.

PALLA VARANES (Cramer).

Papilio varanes, CRAMER, Pap. Exot., II, pl. CLX, figs. D, E (1779).

Two fairly good examples.

Genus CHARAXES, Ochsenheimer.

CHARAXES CITHÆRON, Felder.

Charaxes cithæron, FELDER, Wien. Ent. Mon., III, p. 398, pl. VIII, figs. 2, 3 (1859).

One female of this species.

Family LYCÆNIDÆ, Stephens.

Genus TINGRA, Boisduval.

TINGRA MOMBASÆ, Smith and Kirby.

Tingra mombasæ, SMITH and KIRBY, Rhop. Exot., I, p. 31, Lycænidæ (African), pl. VIII, fig. 11.

One female specimen of this species.

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Genus LYCÆNA, Fabricius.

LYCÆNA GAIKA, Trimen.[1]

Lycæna gaika, TRIMEN, Trans. Ent. Soc. Lond., 3d. ser., I, p. 403 (1862).

The correctness of Mr. Trimen's identification of this insect with *Zizera pygmæa*, Snellen, is unquestionable. I happen to have a good series of the latter species from various parts of oriental Asia, and after a comparison with an equally good series of *L. gaika* coming from Natal and the specimens contained in the present collection, am able to affirm with Mr. De Nicéville that *pygmæa* is "an absolute synonym".

Four examples in good condition.

LYCÆNA LUCIDA, Trimen.

Lycæna lucida, TRIMEN, Trans. Ent. Soc. Lond., 1883, p. 348; S. African Butt., II, p. 47.

One female of this very distinct species, which comes nearest to *L. erschoffii*, Lederer, from northern Persia, so far as the marking of the under side is concerned. The upper side of the male sex is very different, in *L. erschoffii* being dark, bordered upon the costa with deep ultramarine blue, and in *L. lucida* being light blue, inclining to pinkish.

LYCÆNA MORIQUA, Wallengren.

Lycæna moriqua, WALLENGREN, K. Sv. Vet.-Akad. Handl., 1857; Lep. Rhop. Caffr., p. 39.—TRIMEN, S. African Butt., II, p. 75.

Two good specimens of this common South African species.

LYCÆNA TELICANUS (Lang).

Papilio telicanus, LANG, Verz. sein. Schmett., II, p. 47, n. 387-389 (1789).[2]

Four males and one female of this species, which is one of the most widely distributed species of the genus, attaining its maximum size and most beautiful coloring in the region about the head of the Gulf of Guinea.

LYCÆNA PARSIMON (Fabricius).

Papilio parsimon, FABRICIUS, Syst. Ent., p. 526, n. 349 (1775).[3]

One excellent female specimen is the only representative of this large and beautiful species.

LYCÆNA METHYMNA, Trimen.

Lycæna methymna, TRIMEN (part), Trans. Ent. Soc. Lond., 3d series, I, p. 280 (1862); S. African Butt., II, p. 27.

One female, referable according to my view to the female sex of this species.

[1] For synonymy, see Trimen, South African Butterflies, II, p. 50.
[2] For further synonymy see Trimen, South African Butterflies, II, p. 69.
[3] For further synonymy see Trimen, South African Butterflies, p. 18.

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LYCÆNA BÆTICA (Linnæus).

Papilio bæticus, LINNÆUS, Syst. Nat., I, 2, p. 789, n. 226 (1767).

This, the most widely distributed Lycænid butterfly of the Old World, is represented in the collection by two fairly good specimens.

LYCÆNA PALEMON, Cramer.

Papilio palemon, CRAMER, Pap. Exot., IV, pl. CCCXC, figs. E, F (1782).

A fine series of twelve specimens of this species which, with *L. lingeus*, should be separated as one of the new genera when the final revision of the Lycænidæ of the world takes place.

Locality.—Kilimanjaro, 5,000 feet.

LYCÆNA PERPULCHRA, new species.

(Plate VII, fig. 7.)

The upper surface is uniformly pale lilac, shading at the base of the wings into dark gray. The spots of the under surface appear faintly upon the upper side, being reflected through. The margin is fringed with blackish, and there is a black spot surrounded with red between the first and second submedian nervules upon the secondaries. The under side is uniformly pale lilac gray. The fringe is black. There is a uniform submarginal band of subsagittate brown marks upon both wings. At the anal angle of the secondaries there is a black spot slightly irrorated with blue, and between the first and second submedian nervules a black spot marked with bright blue scales in the center. At the ends of the cells in both wings there is a curved black streak. In addition to this, upon the primaries there is a curved row of five large and very distinct black spots, and upon the secondaries three similar black spots at the base, and beyond the cell a row of eight large black spots, forming a longer and shorter loop at the sixth spot, which is the innermost of the series, and is situated just below the black streak at the end of the cell.

Expanse of wings, 40 mm.

This species may be distinguished from other African species by its large size and the distinctness of the large black spots upon the under side of the wings.

One female specimen in the National Museum collection from Kilimanjaro.[1]

[1] Since the foregoing description was written, this species has been described and renamed by both Mr. A. G. Butler and Mr. Roland Trimen; by the former under the name *Castalius hypoleucus* (Proc. Zool. Soc. Lond., 1893, p. 660), and by the latter under the name *Lycæna exclusa* (Proc. Zool. Soc. Lond., 1894, p. 47). Inasmuch as the new species in this paper were, through the kind permission of Professor Riley, all briefly diagnosed and published in The Entomologist, London, September, 1892, the name herein given to the species has priority and must stand.

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Genus CHRYSOPHANUS, Hübner.

CHRYSOPHANUS ABBOTTII, new species.

(Plate VII, fig. 4.)

The markings of the anterior wings upon the upper surface are much as in *C. phlæas*, Linnæus; the markings of the posterior wings upon the same surface recall those of *C. ochimus*, Herrich-Schäffer, female, or of *C. thersamon*, Esper, female.

Male.—Upper side: Anterior wing: The apex of the wing is more acute than in any other species of the genus thus far described. The color is bright metallic orange-red, inclining very slightly to dusky at the base. The costa beyond the middle is very narrowly edged with blackish; the outer margin is evenly bordered with a band of black of moderate width; the body of the wing is adorned by spots of deepest black, arranged as follows—one on the cell, one at the end of the cell, four below the costa coalescing as a subapical band, a pair disposed upon the interspaces between the median nervules, and a quadrangular spot near the outer angle between the first median nervule and the submedian nerve. Posterior wing: The ground color is the same metallic red which prevails upon the forewing, inclining very slightly near the outer margin to opaque scarlet. The base and the inner margin are somewhat densely adorned with a vestiture of dusky hairs. The costal margin is heavily bordered with black, and the outer margin very narrowly with the same color. There is a row of small marginal spots disposed upon the interspaces and fusing with the narrow outer border and causing the red area of the wing within to have a scalloped or crenelated appearance. In addition to these markings there is at the end of the cell a dusky bar, beyond the cell an interrupted transverse series of spots, one near the costa, in some specimens fusing with the dark costal margin, two opposite the cell, a pair upon the interspaces of the median nervules, and a pair upon the inner margin, more or less obscured by the dusky hairs which clothe the base. There is in addition a submarginal row of black spots forming a regular series conformed in the line of curvature with the outer margin of the wing.

Under side: Anterior wing: The under side of the anterior wing differs from the upper side in that the black margin of the outer edge of the wing is lacking, being simply represented by three obsolescent spots, one at the outer angle and two situated between the median nervules. The black spots of the basal and limbal areas of the wings reappear upon the lower side, and are larger and more distinct than upon the upper side, not coalescing at all, and each being surrounded by a faint bluish-white line. Posterior wing: The posterior wing is heavily dusted with dark ferruginous scales, and the markings of the upper side reappear very obscurely upon this side.

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Female.—The female does not differ in anything from the male except that she is lighter in color and the markings are somewhat less distinct.

Expanse of wings, 27–28 mm.

Eight males and two females in the National Museum collection.

Genus LYCÆNESTHES, Moore.

LYCÆNESTHES LARYDAS, Cramer.[1]

The National Museum collection contains three male examples much lighter in color than specimens from west tropical Africa, the region from which the type came.

LYCÆNESTHES LEMNOS, Hewitson.

Lycænesthes lemnos, HEWITSON, Ill. Diurn. Lep., p. 221, No. 8, pl. XC, figs. 13, 14 (1878).

There is one male of this species in the National Museum collection.

I can not agree with Mr. Trimen in sinking *L. lemnos* as a synonym of *L. sylvanus*, Drury. I have an immense series of the latter from Sierra Leone and adjacent regions, all of which are much darker upon the under side than any specimens of *L. lemnos* from the eastern coast that I have ever seen, and differ noticeably in having the spots upon the basal area and near the costal margin of the under side of the secondaries very dark and conspicuous. This is not the case in *L. lemnos*, Hewitson; and besides, the general color of both the under side and the upper side of the wings of the last-mentioned species is much lighter than in *L. sylvanus*, Drury. Mr. Druce, after a careful examination of the types in the Hewitson collection, with some typical specimens of *L. sylvanus*, Drury, before him at the time, reaches the same conclusion which I have expressed, and further gives it as his impression that the female figured by Hewitson as the female of *L. sylvanus* is in fact that sex of *L. lemnos*, Hewitson.

Genus HYPOLYCÆNA, Felder.

HYPOLYCÆNA PHILIPPUS (Fabricius).

Hesperia philippus, FABRICIUS, Ent. Syst. III, 1, p. 283, No. 87 (1793).

One male of this exceedingly widely distributed species.

Genus CHRYSORYCHIA, Wallengren.

CHRYSORYCHIA HARPAX (Fabricius).

Papilio harpax, FABRICIUS, Syst. Ent., App., p. 829, Nos. 327, 328 (1775).

One male of this species, notably larger than any specimens I have ever seen from the more southern portions of the continent.

[1] For synonymy see Trimen, South African Butterflies, II, p. 96.

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Family PAPILIONIDÆ, Leach.

Subfamily PIERINÆ, Swainson.

Genus PONTIA, Fabricius.

PONTIA ALCESTA (Cramer).

Papilio alcesta, CRAMER, Pap. Exot., IV, pl. CCCLXXIX, fig. A (1782).

One female of this species.

Genus TERIAS, Swainson.

TERIAS BRIGITTA (Cramer).

Papilio brigitta,[1] CRAMER, Pap. Exot., IV, pl. CCCXXXI, figs. B, C (1782).

The collection contains one male of this species, in which the marginal border of the secondaries is a little wider than is usual.

TERIAS REGULARIS, Butler.

Terias regularis, BUTLER, Ann. and Mag. Nat. Hist., ser. 4, XVIII, p. 486 (1876).

Four males of this species were taken.

TERIAS BISINUATA, Butler.

Terias bisinuata, BUTLER, Ann. and Mag. Nat. Hist., ser. 4, XVIII, p. 485 (1876).

One male specimen.

TERIAS MANDARINULUS, new species.

(Plate VII, fig. 5.)

Recalling *T. mandarina*, De L'Orza, a well-known Japanese and Chinese species.

Male.—Upper side: Lemon-yellow. The primaries have the apical margin of the costa and the outer margin as far as the first median nervule bordered narrowly with brown, darkest at the tips of the nervules. There is also a small black spot at the inner angle. The secondaries have six minute black spots at the tips of the nervules, but the submedian nervule is not thus ornamented in any of the specimens before me. Under side: Primaries and secondaries have the ends of the nervules tipped with brown. There is a black spot in the middle and one at the end of the cell in the primaries, and a number of waved and broken lines upon the secondaries.

Female.—The female is paler, and the markings are less distinct.

Expanse of wings, 35 mm.

Three males and two females are included in the National Museum collection.

It is with great reluctance that I add another to the long list of names that have been applied to the insects which fall into this genus, but

[1] For further synonymy see Trimen, Butterflies of South Africa.

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after a vain attempt to find any figure or description applicable to the five specimens before me, I have resolved to give them a name which, at least to the student of Asiatic lepidoptera, will prove suggestive and descriptive.

Genus MYLOTHRIS, Hübner.

MYLOTHRIS LASTI, H. Grose Smith.

Mylothris lasti, H. G. SMITH, Ann. and Mag. Nat. Hist., February, 1889, p. 124.

The collection contains two female specimens of this most beautiful species.

Genus PIERIS, Schrank.

PIERIS THYSA, Hopffer.

Pieris thysa, HOPFFER, Monatsber. K. Akad. Wiss. Berl., 1855, p. 639, No. 1; Peter's Reise n. Mossamb., Ins., p. 349, pl. XXI, figs. 7, 8, male; 9, 10 female (1862).

One male specimen.

PIERIS MESENTINA (Cramer).

Papilio mesentina, CRAMER, Pap. Exot., III, pl. CCLXX, figs. A, B (1782).

Five males, one dwarfed female.

PIERIS SEVERINA (Cramer).

Papilio severina, CRAMER, Pap. Exot., IV, pl. CCCXXXVIII, figs. G, H (1782).

Two females.

PIERIS JOHNSTONII (Crowley).

Synchloe johnstonii, CROWLEY, Trans. Ent. Soc. Lond., 1887, p. 35, pl. III, figs. 1–3.

The collection contains three specimens of this species from Kilimanjaro.

Genus TERACOLUS, Swainson.

TERACOLUS HILDEBRANDTII (?) (Staudinger).

Callosune hildebrandtii, STAUDINGER, Exot. Schmett., p. 44, pl. 23.

There is a solitary female of some species of this genus, which I refer with a great deal of doubt to the male described and figured as *Hildebrandtii* by Staudinger in his "Exotische Schmetterlinge."

TERACOLUS CALAIS (Cramer).

Papilio calais, CRAMER, Pap. Exot., I, pl. LIII, figs. C, D (1779).

There are two males of this species in the collection.

TERACOLUS CASTALIS (Staudinger).

Idmais castalis, STAUDINGER, Exot. Schmett., p. 43, pl. 23.

There are two males of this species in the collection which present a wonderful likeness to the genus *Colias*, and might be easily mistaken for albino females of *C. electra*.

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TERACOLUS ANNÆ (Wallengren).

Thestias annæ, WALLENGREN, K. Sv. Vet.-Akad. Handl., 1857; Lep. Rhop. Caffr., p. 16, No. 1.—TRIMEN, South Afr. Butt., III, p. 114.

There are several males of this species in the collection, which do not appear to differ from specimens coming from Natal. This species passes in many collections as *T. danæ*, Fabricius, and was named as *Cinerascens* in 1873 by Mr. Butler. Mr. Trimen in his recent work has unraveled the maze of the synonymy in such a way as to clear up all difficulties.

TERACOLUS AUXO (Lucas).

Anthocharis auxo, LUCAS, Rev. et Mag. Zool., 1852, p. 422.—TRIMEN, South Afr. Butt., III, p. 120.

The collection includes four males and three females of this common and widely distributed species.

TERACOLUS GAVISA, Wallengren, var.

Anthopsyche gavisa, WALLENGREN, K. Sv. Vet. Akad. Handl., 1857; Lep. Rhop. Caffr., p. 13, No. 6.
Teracolus gavisa, TRIMEN, S. Afr. Butt., III, p. 134.

The collection contains two males and four females, which I refer with some doubt to this species. The black bar on the inner margin of the upper side of the primaries is obsolescent, the black spot on the under side is absent, and the nervules of the secondaries on the under side are black, and there is a black band connecting the first and second costal nervules near their extremities. In all other respects the specimens agree with typical *T. gavisa*, Wallengren. The females are, as is characteristic of *T. gavisa*, somewhat variable.

TERACOLUS OMPHALE, Godart.

Pieris omphale, GODART, Enc. Meth., IX, p. 122, No. 12 (1819).—TRIMEN, South Afr. Butt., III, p. 142.

This species is represented by a solitary female.

TERACOLUS PHLEGETONIA, Boisduval.

Anthocharis phlegetonia, BOISDUVAL, Spec. Gen. Lep., I, p. 576, No. 25 (1836).

This pretty little species is represented by two males and one somewhat dwarfed female.

Genus COLIAS, Fabricius.

COLIAS ELECTRA (Linnæus).

Papilio electra, LINNÆUS, Syst. Nat., I, 2, p. 764, n. 101 (1767).

Several males and two females.

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Genus ERONIA, Hübner.

ERONIA DILATATA, Butler.

Eronia dilatata, BUTLER, Proc. Zool. Soc. Lond., 1888, p. 96.

The species is represented in the collection by six males, most of which are in very good condition.

Genus CATOPSILIA, Hübner.

CATOPSILIA FLORELLA (Fabricius).

Papilio florella, FABRICIUS, Syst. Ent., p. 479, No. 159 (1775).—TRIMEN, South Afr. Butt., III, p. 185.

There are numerous specimens of the male, and several specimens of the female of this species. The course which Mr. Trimen pursues in making all the forms of *Catopsilia* (*Callidryas*) found upon the African continent to be merely forms of the one species, *Florella*, seems to me reasonable. Three of the females in the Abbott collection are of the yellow (*Rhadia*) form, and one is white. The yellow is the form I have prevalently received from Gaboon and the Congo region, from which I have in recent years obtained scores of specimens. It is the predominant form of the female.

Subfamily PAPILIONINÆ, Swainson.

Genus PAPILIO, Linnæus.

PAPILIO DEMOLEUS, Linnæus.

Papilio demoleus, LINNÆUS, Mus. Ulr., p. 214 (1764).

Numerous examples of this exceedingly common species.

PAPILIO LYÆUS, Doubleday.

Papilio lyæus, DOUBLEDAY, Ann. Nat. Hist., XVI, p. 178 (1845).—TRIMEN, S. Afr. Butt., III, p. 237.

I follow Mr. Trimen in separating this form from *P. nireus*, but do so, as Mr. Trimen admits that he himself does, with much doubt as to the scientific accuracy of this course, though there is some profit no doubt in clearly discriminating between the two forms.

PAPILIO CORINNEUS, Bertholini.

Papilio corinneus, BERTHOLINI, Mem. Acad. Sci. Bologn., 1849, p. 9, pl. I, figs. 1–3.—TRIMEN, S. Afr. Butt., III, p. 217.

Two specimens of this species.

PAPILIO CENEA, Stoll.

Papilio cenea, STOLL, Suppl. Cram. Pap. Exot., p. 134, pl. XXIX, figs. 1, 1a (1791).

Two males of the variety with the very broad black submarginal band upon the secondaries.

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Family HESPERIDÆ, Leach.

Genus CYCLOPIDES, Hübner.

CYCLOPIDES METIS, Linnæus.

Papilio metis, LINNÆUS, Mus. Ulr., p. 325 (1764).

There are two males in the collection which agree very well in all respects with specimens of *C. metis* from the region of the Cape, except that upon the under side of the primaries there is no basal yellow ray coalescing with the yellow spot in the cell. Otherwise I can see no reason for discriminating between them and the typical form.

Genus PARDALEODES, Butler.

PARDALEODES GALENUS, Fabricius.

Hesperia galenus, FABRICIUS, Ent. Syst., III, 1, p. 350, No. 332 (1793).

One damaged female.

Genus PAMPHILA, Fabricius.

PAMPHILA ERINNYS, Trimen.

Pamphila erinnys, TRIMEN, Trans. Ent. Soc. Lond., 3d ser., I, p. 290 (1861).

One good male of this species corresponding with the description of the aberrant form given by Trimen.[1]

PAMPHILA ZENO, Trimen.

Pamphila zeno, TRIMEN, Trans. Ent. Soc. Lond., 3d ser., II, p. 179 (1864); S. Afr. Butt., III, p. 313.

The collection contains one male which I identify as that sex of *P. zeno*, though in one or two minute particulars the specimen before me does not quite tally with the description given by Trimen.

PAMPHILA HOTTENTOTA (Latreille).

Hesperia hottentota, LATREILLE, Enc. Meth., IX, p. 777, n. 133 (1823).

One female example.

PAMPHILA BORBONICA, Boisduval.

Hesperia borbonica, BOISDUVAL, Faune Ent. Madagas., p. 65, No. 3, pl. IX, figs. 5, 6 (1833).

Three males of this species.

PAMPHILA, sp. (?)

There is an injured specimen of an obscure species of *Pamphila* related to *Hottentota*, which is unlike anything known to me, and which I nevertheless do not wish to attempt to describe without better material.

[1] South African Butterflies, III, p. 327.

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Genus ISMENE.

ISMENE FORESTAN, Cramer.

Papilio forestan, CRAMER, Pap. Exot., IV, pl. CCCXCI, figs. E, F (1782).

The collection contains one male of this species in no wise differing from specimens from the region of the Cape.

ISMENE CHALYBE, Westwood.

Ismene Chalybe, WESTWOOD; DOUBLEDAY and HEWITSON, Gen. Diurn. Lep., pl. 79, fig. 2 (1852).

One example of this well-known species.

Suborder HETEROCERA.

Family SPHINGIDÆ, Boisduval.

Genus MACROGLOSSA, Scopoli.

MACROGLOSSA HIRUNDO, Gerstäcker.

Macroglossa hirundo, GERSTÄCKER, Gliederth.-Fauna d. Sansibar-Gebietes, p. 375, pl. XV, fig. 7.

There is one example of the male of this common East African species.

MACROGLOSSA TROCHILOIDES, Butler.

Macroglossa trochiloides, BUTLER, Proc. Zool. Soc. Lond., 1875, p. 5, No. 6; Trans. Zool. Soc. Lond., IX, p. 525.

There is one greased specimen of the male of this species in the collection.

Locality.—Kilimanjaro.

Family AGARISTIDÆ, Swainson.

Genus HESPAGARISTA, Walker.

HESPAGARISTA INTERLECTA, Angas.

Hespagarista interlecta, ANGAS, Kaffirs Illustrated, pl. 30, fig. 10.

The collection contains a single male of this species.

Family SYNTOMIDÆ.

Genus PITTHEA, Walker.

PITTHEA TRIFASCIATA, Dewitz.

Pitthea trifasciata, DEWITZ, Nov. Act. K. Leop. Car. Deutsch. Akad., XLII, No. 2, p. 82, pl. III, fig. 3.

One specimen.

Family LITHOSIIDÆ.

Genus PRABHASA, Moore.

PRABHASA INSIGNIS, Butler.

Prabhasa insignis, BUTLER, Cist. Ent., III, p. 8.

Several specimens from Kilimanjaro.

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Genus LEPISTA, Wallengren.

LEPISTA PANDULA (Boisduval).

Lithosia pandula, BOISDUVAL, Delegorgue Voy. Afr. Austral., II, p. 597, No. 130.

The collection contains one female agreeing absolutely with specimens in the British Museum. *L. limbata*, Butler, described from a male specimen taken at Kilimanjaro, and now in the British Museum, may be the male of this species.

Genus SOZUZA, Wallengren.

SOZUZA STEVENSII, new species.

(Plate VII, fig. 14.)

Female.—Front, antennæ, and eyes black; top of head, collar, tegulæ, thorax, abdomen, and anterior wings pale gray. Posterior wings lighter gray. Anterior wings narrowly margined upon costa with black. The under side is much as the upper side, save that the anterior wings are shaded with blackish beneath.

Expanse of wings, 44 mm.

The type, one example from Kilimanjaro, is in the National Museum collection.

I name this species in honor of Mr. Stevens, the bicyclist, who accompanied Dr. Abbott upon his journey to Kilimanjaro.

Family ARCTIIDÆ, Stephens.

Genus UTETHEISA, Hübner.

UTETHEISA PULCHELLA, Linnæus.

Tinea pulchella, LINNÆUS, Syst. Nat., I, 2, 884, p. 348.

One specimen.

Genus SPILARCTIA, Butler.

SPILARCTIA ABBOTTII, new species.

Male.—Head, thorax, body, and anterior wings luteous. The five posterior segments of the abdomen are banded with black upon the upper side. Upper side: The anterior wings have three minute black spots before the base, two poorly defined spots at the end of the cell, a submarginal series of minute spots bifurcating near the apex, and a small marginal spot at the end of each nervule. All of these spots are dark brown, or black. The posterior wings are white and semi-diaphanous, with a minute black spot at the end of the cell. Under side: The wings upon the under side are white, shading into luteous upon the costa of the primaries. The spots of the upper side disappear upon the under side, or are very faint, except the spots at the end of the cell, which are much larger than upon the upper side, and,

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coalescing, form a bold, comma-shaped mark, and the two spots of the inner branch of the bifurcating submarginal series, which are nearest the costa of the primaries, and are relatively large and conspicuous, especially the one nearest the costa.

Expanse of wings, 31 mm.

There are several specimens in the National Museum collection.

Genus ALPENUS, Walker.

ALPENUS TRIFASCIATA, new species.

(Plate VII, fig. 10.)

Male.—Antennæ, eyes, and front black. Collar, patagia, and thorax very pale ashen. Abdomen yellowish, with a row of seven small black spots on the top and a similar series on the sides. Legs margined with black upon the upper side. The anterior wings are pale ashen, nearly white, and have three transverse macular bands, one near the base, one at the end of the cell, and one on the limbal area. These bands are very sharply angulated about the region of the median nervule, and the spots are here produced along the nervules as lines. The spots composing these bands are all black, and are largest upon the costa and near the inner margin of the wing. The posterior wings have a round blackish spot at the end of the cell, one near the outer angle, and another near the anal angle. The under side is somewhat darker than the upper side, and almost all of the spots of the upper surface are obliterated, or only very faintly reappear upon the lower side.

Expanse of wings, 30 mm.

Type in the National Museum collection, from Kilimanjaro.

Genus TERACOTONA, Butler.

TERACOTONA CLARA, new species.

(Plate VII, fig. 12.)

Male.—Antennæ light in color. Tibiæ of anterior pair of legs bright pink. Head, collar, patagia, and thorax very dark brown. Region of metathorax clothed with long pinkish hairs. Abdomen pale brown, annulated and spotted on sides with black. Forewings uniformly brown, not so dark in color as the thorax, thickly strewn with blackish scales, and with a large black spot at the end of the cell and a faint curved transverse black line beyond the cell. Posterior wings white, tinged with pink and yellowish on the costa and outer margin, and with a black spot at the end of the cell. On the under side, the anterior wings are lighter than upon the upper side, and are broadly washed with pink upon the costa. They are darkest in color near the apex. None of the markings of the upper surface reappear, except the spot at the end of the cell, which is very distinct. The posterior wings are on the under side as upon the upper.

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Expanse of wings, 36 mm.

Type in the National Museum, from Kilimanjaro.

This species is fully one-third less in size than *T. obscura* and *T. sub macula*, both of which species were described by Walker.

Genus PELACHYTA, Hübner.

PELACHYTA MAURITIA, Stoll.

Noctua mauritia, STOLL, Pap. Exot., IV, pl. 345 B.

Genus METARCTIA, Walker.

METARCTIA INCONSPICUA, new species.

(Plate VIII, fig. 3.)

Male.—Antennæ, head, collar, and abdomen light reddish-brown, brightest upon the collar. The tegulæ and the upper surface of the thorax are darker brown, without the reddish cast. The upper surface of the anterior wings is of the same color as the upper side of the thorax. The posterior wings are pale, creamy gray, shading on the inner margin into luteous. The under side of both wings is pale ashen gray, tinged with luteous upon the costa.

Expanse of wings, 30 mm.

Described from one specimen in the collection. This insect is represented in the collection of Mr. Herbert Druce by a male and female specimen from the Congo.

Family LIPARIDÆ, Boisduval.

Genus LEUCOMA, Stephens.

LEUCOMA TAVETENSIS, new species.

Male.—Head pale luteous. Antennæ, legs, and body pale gray. The wings on both surfaces are white, shading into pale gray on the costa upon the upper surface of the primaries. The edges of the costæ and the fringes of the wings upon the under side are very narrowly pure white. The wings are immaculate, save that at the end of the cell in the primaries there are two minute black spots, visible only upon the upper surface.

Expanse of wings, 40 mm.

The type, a male, is unique in the National Museum collection, and is labeled "Taveta, May, 1888."

Family LASIOCAMPIDÆ, Harris.

Genus LICHENOPTERYX, Felder.

LICHENOPTERYX DESPECTA, Felder.

Lichenopteryx despecta, FELDER, Nov. Reise, Lep., IV, pl. 95, fig. 5.

One female specimen.

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Genus STIBOLEPIS, Butler.

STIBOLEPIS ATOMARIA, new species.

Male.—Front reddish. Collar, patagiæ, and upper side of thorax gray. Legs and under side of thorax and upper and under side of abdomen ocherous. The wings are uniformly light gray upon the upper side, and thickly sown with dark scales, producing a "salt and pepper" effect. Upon the costa of the primaries there is a faint tendency of these black atoms to arrange themselves in bands, especially near the base of the wings. The margin is very narrowly dark gray and the broad fringes are pale ashen. The under side of the wings is uniformly pale gray, shading into ocherous at the base. The wings are thickly dusted over with dark scales upon the outer half and on the costa. These scales are so arranged, just beyond the cell, as to present the appearance of four or five faint and narrow bands. The anterior wings, near the base and below the cell, have few markings.

Expanse of wings, 55 mm.

The type is unique in the collection, and is labeled "Zanzibar" by the authorities of the Museum. But I have a specimen in my own collection which came from near Taveta, and was collected by a French naturalist, so that the type was probably from the interior.

Family LIMACODIDÆ, Boisduval.

Genus COSUMA, Walker.

COSUMA MARGINATA, new species.

(Plate VII, fig. 11.)

Male.—Antennæ, head, and body dark olivaceous. Upper side: Anterior wings pale olivaceous and the posterior wings still paler. Both wings have a silky luster. There is a well-defined round, cream-colored mark at the end of the cell of the primaries. The margins have a very narrow stramineous border interrupted by the darker nervules. The fringes are of the same color as the body of the wings. Under side: Both wings are marked as upon the upper surface, but are paler, and the marginal maculations are larger and more distinct.

Expanse of wings, 28 mm.

The type, in the National Museum collection, is unique.

Family SATURNIIDÆ, Boisduval.

Genus GYNANISA, Walker.

GYNANISA ISIS (Westwood).

Saturnia isis, WESTWOOD, Jard. Nat. Libr., Entom., VII, 138, pl. 13.

One male in good condition, and larger than usual in specimens from Delagoa Bay.

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Genus COPAXA, Walker.

COPAXA FLAVINATA (Walker).

Dreata flavinata, WALKER, Cat. Lep. Het. Brit. Mus., XXXII, p. 373

One male.

Family COSSIDÆ.

Genus DUOMITUS, Butler.

DUOMITUS KILIMANJARENSIS, new species.

(Plate VII, fig. 8.)

Male.—Antennæ, head, thorax, body, and legs brown. Metathorax heavily clothed with pale cinereous hairs. Upper side: Anterior wings wood-brown, darkest on the costa near the base. The wing is profusely mottled with small brown spots, and is crossed beyond the cell by a broad band of very dark brown, which does not touch the costa, nor quite reach the inner edge. This band is split by a wedge of very pale brown at the end nearest the inner margin. The wing is further ornamented by an interrupted, irregular submarginal band of brown. The posterior wing is paler in color than the anterior wing. The limbal area of this wing is ornamented by spots growing darker and heavier toward the outer margin. Near the outer angle these spots are fused so as to form a V-shaped mark. Under side: Upon the under side the wings are darker than upon the upper side, and the same markings reappear, but heavier, and more sharply defined.

Expanse of wings, 58 mm.

The type in the National Museum collection is unique.

Family HEPIALIDÆ.

Genus HEPIALUS, Fabricius.

HEPIALUS KENIÆ, new species.

(Plate VII, fig. 6.)

Female.—Antennæ, head, thorax, body, and legs brown. The metathorax is heavily clothed with pale cinereous hairs. Upper side: Anterior wings wood-brown. About the middle of the costa there are three dark brown spots. Above the cell, about one-third of the way from the base, is a large pale spot slightly clouded with brownish in the center. A smaller oval spot of like color appears in the cell near its end. Above the end of the cell there are two small, silvery, sagittate marks with their points in opposite directions, the one above the other. The larger arrow, which has its barbs toward the outer border of the wing, is immediately followed by a short curved band of brown spots bordered inwardly and outwardly by pale cinereous; this short band is followed by a longer submarginal band of similar spots, extending from near the apex to before the outer angle; there are also two comma-

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shaped streaks below the cell on the inner margin, inclosing between them a dark circular spot bordered by lighter cinereous. The posterior wings are uniformly fuliginous grey, as is also the entire under-surface of both wings.

Expanse, 50 mm.

The type, in the National Museum collection, is unique.

Genus GORGOPIS, Hübner.

GORGOPIS ABBOTTII, new species.

(Plate VII, fig. 9.)

Male.—The body and the wings upon both the upper and the under side are very pale fawn, shading at the commissures of the wings and the costæ into pale luteous. The vestiture of the body and the wings is lustrous and silky.

Expanse of wings, 45 mm.

The National Museum collection contains a couple of specimens. The species is represented in the collection of Mr. Herbert Druce by an unnamed example coming from the region of the Cape.

Group NOCTUÆ.

Family HADENIDÆ.

Genus CONSERVULA, Grote.

CONSERVULA MINOR, new species.

(Plate VIII, fig. 1.)

Male.—Front white. The thorax and abdomen are pale brown. The anterior wings are of the same color as the thorax, lustrous and ornamented with darker brown lines and spots which are all margined externally by paler lines. These lines are as follows: Near the base three short lines succeeding each other, and running parallel to the outer margin, a broader band starting at the inner third upon the costa and traversing the wing on a line at right angles with the lines at the base, and fusing just below the end of the cell with a line originating near the costa at the outer third and running parallel to the outer margin as far as the inner margin. The Y-shaped mark thus formed, incloses a large spot at the end of the cell. There is a slightly curved submarginal band. The posterior wings are white, slightly tinged with pinkish. The under side of both wings is pale grayish, with an obscure blotch of darker color at the ends of the cells on both wings.

Expanse of wings, 32 mm.

Type in the National Museum collection, from Kilimanjaro.

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Family OMMATOPHORIDÆ, Guénée.

Genus PATULA, Guénée.

PATULA MACROPS (Linnæus).

Phalæna-Attacus macrops, LINNÆUS, Syst. Nat., Ed. 12, III, p. 225 (1768).

One example from Taveta, May, 1888.

Genus CYLIGRAMMA, Boisduval.

CYLIGRAMMA LATONA, Cramer.

Phalæna latona, CRAMER, Pap. Exot., I, 20, pl. XIII, fig. B.

One good specimen.

Family HYPOPYRIDÆ, Guénée.

Genus CALLIODES, Guénée.

CALLIODES PRETIOSISSIMA, new species.

(Plate VIII, fig. 2.)

Male.—Allied to *C. pyrula*, Hopffer, but differing in having the ground color of the upper surface brown and under side tawny. Upon the upper side of the secondaries there are more lines than in Hopffer's species, and upon the under side there is a transverse median line angulated at the end of the cell.

Expanse of wings, 40 mm.

The type, in the National Museum collection, is unique.

OGOVIA, new genus.

Allied to *Hypopyra*, and in general outline somewhat suggesting *Sphingomorpha*. Abdomen produced fully one-third of its length beyond the posterior wings, and tufted at its anal extremity in the male. Forewings narrow, produced, very falcate at the apex, and rounded on the inner angle. Posterior wings subtriangular, the outer margin evenly rounded. Patagia very long, covering the commissures of both the anterior and posterior wings. Palpi compressed at base, porrect, the first joint flattened vertically, the second subconic, the third slender and slightly knobbed at the end. The antennæ are long, and serrate for two-thirds of the distance from the base. The tibiæ are very densely clothed with hair. The general coloration is brown, with a submarginal transverse line sharply angulate at the apex and returning parallel to the costa.

Type.—*O. tavetensis*, Holland.

OGOVIA TAVETENSIS, new species.

(Plate VII, fig. 13.)

Male.—The first joint of the palpi is dark brown, the second and third are lighter, corresponding with the general color of the body. The eyes are large, prominent, black. The front is light brown. The

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hairs of the collar are erect, and in front thickly compressed and arranged in the form of two upright dark-brown fan-shaped masses. The body of the collar, the patagia, the thorax, and the abdomen are light wood-brown, corresponding with the color of the anterior wings. There are two dusky stripes on the abdomen, one on either side. The under side of the body and legs are uniformly light wood-brown. The anterior wings are very sharply falcate, and broadly and evenly rounded at the inner angle. The ground color of the anterior wings upon the upper side corresponds with that of the thorax. There is a round dark spot in the cell, and some faint darker markings about the middle of the outer margin and at the apex. Beginning below the costa, about one-third of the distance from the apex, there is a narrow yellow line, which extends outwardly to within about two millimeters of the margin, where it forms an acute angle with a similar line running from the costa just before the apex to the inner margin before the outer angle. These yellow lines are bordered faintly on both sides by brown. The color of the posterior wings is dark brown, lighter at the base, and with some faint yellowish and black striæ at the anal angle. The color of the under side of the wings is light brown, slightly glossed with purple. The forewing is clouded with fuliginous near the inner margin; the hind wing is hoary on the inner margin. A band of minute blackish spots traverse the limbal area of both wings, and there are a few similar spots near the apex of the primaries.

Expanse of wings, 52 mm.

The type, in the National Museum, is unique.

Family OPHIUSIDÆ, Guénée.

Genus GRAMMODES, Guénée.

GRAMMODES STOLIDA (Fabricius).

Noctua stolida, FABRICIUS, Ent. Syst., 599.

One example of this species, which is also found in Europe.

Genus TRIGONODES, Guénée.

TRIGONODES MAHARA, Felder and Rogenhofer.

Trigonodes mahara, FELDER and ROGENHOFER, Lep. Nov. Reise, pl. CXVII, fig. 13.

This species is very near *T. acutata*, Guénée.

Family DYSGONIIDÆ, Moore.

Genus SPHINGOMORPHA, Guénée.

SPHINGOMORPHA MONTEIRONIS, Butler.

Sphingomorpha monteironis, BUTLER, Ann. and Mag. Nat. Hist. (4), XIV, p. 406.

Family REMIGIIDÆ, Guénée.

Genus REMIGIA, Guénée.

REMIGIA CONVENIENS, Walker.

Remigia conveniens, WALKER, Cat. Lep. Het. Brit. Mus, XIV, p. 1507.

This species is represented by one male and one female specimen.

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Family HYPENIDÆ, Guénée.

Genus HYPENA, Schrank.

HYPENA, sp. (?)

A specimen too much worn to be identified.

Group GEOMETRÆ.

Family ENNOMIDÆ, Guénée.

Genus TETRACIS, Guénée.

TETRACIS, sp. (?)

The specimen is too poor to be determined.

Family MACARIIDÆ.

Genus GONODELA, Boisduval.

GONODELA KILIMANJARENSIS, new species.

(Plate VIII, fig. 4.)

Front, the entire body, and both wings upon the upper surface as far as the transverse exterior line pale lilacine gray. Upper side: The outer third of both wings between the transverse exterior line and the margin broadly and uniformly dark purplish grey, save a few faint cloudings of lighter color. Both wings have a black point at the end of the cell. Upon the primaries there is a basal, a transverse median, and a transverse exterior line, all parallel, and all angulated below the costa. The transverse outer line is continued upon the secondaries as the transverse median line of the secondaries and becomes diffuse, and is interrupted by the black dot at the end of the cell. The transverse outer line of the secondaries is narrow, dark, and distinct. The margins are dark brown, darkest on the intraneural interspaces; the fringes are uniformly grayish. Under side: The ground color is whitish, tinged with ochreous on the costæ of both wings, and profusely mottled with small brown points and blotches. The exterior margin is broadly rufous, save where the faint cloudings of the upper surface are reproduced as broad and distinctly defined patches of the prevalent whitish ground color of the under side. The lines and points of the upper side are otherwise very indistinctly and feebly reproduced upon the lower side.

Expanse of wings, 35 mm.

The type, in the National Museum collection, is unique.

GONODELA RHABDOPHORA, new species.

(Plate VIII, fig. 5.)

The ground color is whitish, with profuse minute maculations. At the base of the primaries there is an oblique brown line, which is followed about the middle by a line which is curved or hooked like a

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crozier just below the costa. On the costa before the apex is a subtriangular brown spot. Beginning just below the apex on the outer margin and extending obliquely across the wing to the middle of the inner margin is a broad dark line, beyond which the entire outer portion of the wing is clouded with dark brown. A still darker curved line traverses this dark triangular area, and terminates just before the outer angle. The posterior wing is ornamented by a broad median band, and a very broad submarginal band, straight internally and indented externally. The margin is clouded with brown. Under side: The markings of the upper side are reproduced upon the under side, but the bands are all warm ferruginous, and are more clearly and sharply defined.

Expanse of wings, 32 mm.

The type, in the National Museum collection, is unique.

GONODELA, sp. (?)

The specimen represents a form very near, if not identical with, a species to which Mr. Warren has affixed the name *maculosa* in the collections of the British Museum, and as Mr. Warren has prepared a manuscript description which may shortly be published, I refrain from characterizing this form.

Genus TEPHRINA, Guénée.

TEPHRINA OBSERVATA, Walker.

Tephrina observata, WALKER, Cat. Lep. Het. Brit. Mus., XXIII, p. 963.

Genus EUBOLIA, Boisduval.

EUBOLIA, sp. (?)

The hind wings are almost entirely wanting from the specimen, and I cannot therefore attempt to describe it. The species is not represented in the British Museum.

Genus SIONA, Duponchel.

SIONA, sp. (?)

I refer two specimens, with some doubt, to Duponchel's genus *Siona*. They are not found in the British Museum, but are in too poor a condition to warrant description.

Family FIDONIDÆ, Guénée.

Genus STERRHA, Hübner.

STERRHA SACRARIA (Linnæus).

Phalæna-Geometra sacraria, LINNÆUS, Syst. Nat., I, 2, p. 863 (1766).

Several examples.

Gen. (?) sp. (?)

A geometer too poor to determine anything about it.

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Group PYRALES.

Genus STEMORRHAGES, Lederer.

STEMORRHAGES THALASSINALIS (Boisduval).

Botis thalassinalis, BOISDUVAL, Faune Ent. Madgr., p. 117, pl. XVI, fig. 6.

Boisduval makes this insect the same as *sericea*, Drury, and applies the name upon the ground that there is already a *Botis sericealis*. But the anal tuft in *sericea*, Drury, is black, whereas in the present form it is grassy-green as the rest of the body. I therefore retain the name of Boisduval, in spite of the fact that Walker has sunk it as a synonym of *sericea*, Drury. This it most certainly is not, though the author of the name regarded it as identical with *sericea*, Drury. *Sericea*, Drury, and *thalassinalis*, Boisduval, must both stand.

One example.

Genus HYMENIA, Hübner.

HYMENIA FASCIALIS (Cramer).

Phalæna fascialis, CRAMER, Pap. Exot., IV, pl. CCCXCVIII, fig. C.

One example.

Group PHYCITES.

Genus CANTHELEA, Walker.

CANTHELEA SATURATELLA, Mabille.

One example. So determined by Mons. E. Ragonot, of Paris.

Besides these species, there are two specimens of small Tineid moths in bad condition, which I am altogether unable to name, and which no one to whom I have shown them can assist me in naming.

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LIST OF THE LEPIDOPTERA COLLECTED IN SOMALI-LAND, EAST AFRICA, BY MR. WILLIAM ASTOR CHANLER AND LIEUTENANT VON HŒHNEL.

By W. J. HOLLAND, Ph. D.

ACCORDING to information given me by the authorities of the National Museum, the collections before me consist of two lots, the first contained in two boxes, and representing specimens captured in the region of the Tana River, upon the journey from the coast to Hameye; and the second, contained in one box, representing collections made solely by Mr. Chanler, but taken upon practically the same territory. The specimens are not always in good condition, and in many cases represent, as the following list will show, species which are common in collections.

Suborder RHOPALOCERA.

Subfamily DANAINÆ.

Genus DANAIS, Latreille.

DANAIS CHRYSIPPUS, Linnæus.

One typical male, labeled "Tana River."

DANAIS CHRYSIPPUS, Linnæus, var. KLUGII, Butler.

Thirty-two examples, one male with the secondaries white, as in the variety *Alcippus*.

DANAIS PETIVERANA, Doubleday.

One example, from the Tana River.

Subfamily SATYRINÆ.

Genus MELANITIS, Fabricius.

MELANITIS LEDA, Linnæus, var. SOLANDRA, Fabricius.

One specimen.

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Genus YPHTHIMA, Hübner.

YPHTHIMA CHANLERI, new species.

Upper side brown, paler toward the outer margin and the apex. The ocellar tract is not separated in any way from the adjacent portion of the wings, the brown color shading by imperceptible degrees from the base, where it is almost black, to the outer margin, where the wings are pale wood-brown. There is a narrow dark submarginal line, which does not quite reach the inner margin on either wing. On the primaries there is a large, sharply defined subapical ocellus, bipupilled, with the iris orange-red, surrounded with a narrow dark-brown shade. Upon the secondaries there are two unipupillate ocelli of moderate size, one upon each of the median interspaces. Upon the under side the primaries are as upon the upper side, but slightly paler. The secondaries have in addition to the two ocelli of the upper side another of equal size upon the first costal interspace, and a very small one adjacent to the innermost of the two on the median interspaces. The ocellus of the primaries on the under side is bipupillate, as upon the upper side; the ocelli of the secondaries are unipupillate. A narrow, slightly irregular dark-brown band runs from the ocellus at the costa across the wing to the inner margin. The sex mark is not apparent upon the upper surface of the primaries.

Expanse of wings, 40 mm.

The type in the National Museum collection, from the Tana River, is unique.

Having carefully examined the descriptions of all the species enumerated in the recent monograph of this genus by Messrs. Elwes and Edwards, I can find no account of any species from the African region which applies to the specimen before me. *Y. vinsoni* comes nearest to meeting the requirements, but the under side of the secondaries is totally different.

Subfamily ACRÆINÆ.

Genus ACRÆA, Fabricius.

ACRÆA MINIMA, Holland.

Eleven examples from the region of the Tana.

ACRÆA BUXTONI, Butler.

Thirty-three specimens, male and female.

ACRÆA SGANZINI, Boisduval.

Three specimens. They are referable to the varietal form named *A. usugaræ* by Mons. Vuillot.

ACRÆA JOHNSTONI, Godman.

One female.

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ACRÆA LYCIA, Fabricius.

One example.

ACRÆA CABIRA, Hopffer.

A single specimen of the male.

ACRÆA ESEBRIA, Hewitson.

A solitary female.

ACRÆA sp.(?)

A badly damaged female, which agrees with specimens labeled "*A buxtoni*, Butler," which I have received from Mr. Trimen, but which I think can scarcely be the females of that species. If they are, then the female is dimorphic in a surprising manner. The long suite of *A. buxtoni* in this collection shows that the females on the Tana River do not have the primaries as dark as in these specimens from Mr. Trimen, nor the subapical transverse band nearly white, as in them. It is hazardous to question the determinations of so experienced a student as Mr. Trimen, but I think there is an error here.

Family NYMPHALINÆ.

Genus JUNONIA, Hübner.

JUNONIA CLELIA, Cramer.

Two males and one female.

JUNONIA ŒNONE, Linnæus.

Four males and three females.

Genus PRECIS, Hübner.

PRECIS LIMNORIA, Klug.

Six examples.

PRECIS NATALICA, Felder.

One fragmentary specimen.

PRECIS CLOANTHA, Cramer.

One specimen.

PRECIS CUAMA, Hewitson.

Two specimens.

Genus EURYTELA, Boisduval.

EURYTELA OPHIONE, Cramer.

One poor specimen.

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Genus HYPANIS, Boisduval.

HYPANIS ILITHYIA, Drury.

Five examples of the typical form and one of the variety *Cora*, Feisth.

Genus HYPOLIMNAS, Hübner.

HYPOLIMNAS MISIPPUS, Linnæus.

Two males and one female of the typical form, and two females of the dimorphic form *Inaria*, Cramer.

HYPOLIMNAS ANTHEDON, Doubleday.

One example of this species, which is identical with *Wahlbergi*, Wallengren.

Genus EUPHÆDRA, Hübner.

EUPHÆDRA NEOPHRON, Hopffer.

Two specimens.

Genus CHARAXES, Ochsenheimer.

CHARAXES CASTOR, Cramer.

One badly injured male.

CHARAXES CANDIOPE, Godart.

Two fairly well-preserved males.

CHARAXES NEANTHES, Hewitson.

Two specimens.

CHARAXES CHANLERI, new species.

This species comes nearer to *C. kirkii*, Butler, than any other, but may be distinguished from that species by the fact that the secondaries have no red inclosed spots or curved dashes in the first four divisions of the marginal markings, as described by Dr. Butler; the submarginal series of lunulate spots are not white edged, as in *Kirkii*, and there is no discal lunulate green line as in Dr. Butler's species. The primaries, moreover, are not shot with steel blue at the base.

Expanse of wings, 65 mm.

Four damaged males of this species in the National Museum collection. The species is allied to *C. guderiana*, Dewitz, resembling the latter in the form of the wings.

Genus PALLA, Hübner.

PALLA VARANES, Cramer.

There is one specimen of this species in the collection.

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Family LYCÆNIDÆ.

Genus LUCIA, Swainson.

LUCIA BIBULUS, Fabricius.

One specimen.

Genus LYCÆNA, Fabricius.

LYCÆNA PALEMON, Cramer.

The collection contains a single specimen of this species.

LYCÆNA BÆTICA, Linnæus.

One example.

LYCÆNA GAIKA, Trimen.

A single specimen.

Subfamily PIERINÆ.

Genus TERIAS, Swainson.

TERIAS ZOE, Hopffer.

Four males and three females.

TERIAS FLORICOLA, Boisduval.

Six specimens.

Genus PIERIS, Schrank.

PIERIS GIDICA, Godart.

One pale specimen of the male, to which the label *P. abyssinica*, Lucas, had been attached before it came into my hands. The specimen does not belong to the form described by Lucas.

PIERIS LILIANA, H. Grose Smith.

A number of examples, male and female.

Genus ERONIA, Hübner.

ERONIA DILATATA, Butler.

One male.

Genus CATOPSILIA, Hübner.

CATOPSILIA FLORELLA, Fabricius.

A single specimen.

Genus COLIAS, Fabricius.

COLIAS ELECTRA, Linnæus.

Several examples, including a couple of the dimorphic females.

Genus HERPÆNIA, Butler.

HERPÆNIA ERIPHIA, Godart.

One example.

Genus TERACOLUS, Swainson.

TERACOLUS ERIS, Klug.

A solitary specimen.

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TERACOLUS EVARNE, Klug.

Seven males and two females.

TERACOLUS GAVISA, Wallengren, var. (?)

A single example of the form described in the preceding paper upon the collections of Dr. W. L. Abbott. This may be a new species, but in the face of the very great difficulties which surround the determination of the species of this genus, I do not dare to characterize the form as a distinct species, and thus perhaps add another to the puzzles of future laborers in the field.

TERACOLUS HETÆRA, Gerstæcker.

A sadly battered specimen of the male of this species.

Subfamily PAPILIONINÆ.

Genus PAPILIO, Linnæus.

PAPILIO LEONIDAS, Fabricius.

A tattered male.

PAPILIO CORINNEUS, Bertholini.

A single specimen.

PAPILIO CENEA, Stoll.

A male, not to be distinguished from specimens coming from Natal and the region of the Cape.

Suborder HETEROCERA.

Family SPHINGIDÆ.

Genus CEPHONODES, Hübner.

CEPHONODES HYLAS, Linnæus.

One bad specimen.

Genus LOPHOSTETHUS, Butler.

LOPHOSTETHUS DUMOLINII, Latreille.

A torn example of the male.

Family SATURNIIDÆ.

Genus CERANCHIA, Butler.

CERANCHIA MOLLIS, Butler.

One example.

Besides the species enumerated, there are two examples of some zygænid moth, which are too poor to venture to name or determine. They were evidently taken just at the time when emerging from the chrysalis, and are not sufficiently developed to make them proper subjects for study.

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LIST OF THE LEPIDOPTERA FROM ALDABRA, SEYCHELLES, AND OTHER EAST AFRICAN ISLANDS, COLLECTED BY DR. W. L. ABBOTT.

By W. J. HOLLAND, Ph. D.

THE small collection of lepidoptera made by Dr. Abbott in the islands lying west and north of Madagascar in the Indian Ocean contains but little that is apparently new to science, but possesses interest as illustrating the geographical distribution of genera and species. Thus far almost nothing has been written upon the lepidopterous fauna of the Seychelles, and, in fact, with the exception of the flora, the natural treasures of these islands have been apparently almost overlooked by students. While a constant trade relationship with them has been maintained for more than a century by Europeans, they have been but infrequently visited by naturalists, and those who have made collections there, have apparently done but very little more than to collect the commoner and most conspicuous species. I can discover only half a dozen references to the insects of the Seychelles in the whole compass of entomological literature. In Kirby's "Catalogue of Diurnal Lepidoptera" only one species is credited to these islands, and that with doubt. The following list will serve to show that the fauna possesses affinities at once with that of Africa and of Asia, and that many of the species are almost cosmopolitan in their range. *Hypolimnas misippus* and *Ilattia octo* are common both to the Old World and the New. Some of the species range into Europe. This character of the fauna suggests its adventitious nature, and I suspect that it will be found to possess in this respect a strong likeness to other insular faunas. It is made up of certain genera possessing great capabilities for migration, and apparently a strong power to resist change under varying conditions.

Suborder RHOPALOCERA.

Subfamily DANAINÆ, Bates.

Genus DANAIS, Latreille.

DANAIS CHRYSIPPUS (Linnæus).

Papilio chrysippus, LINNÆUS, Mus. Ulr., p. 263.—CLERCK, Icones, pl. 57, fig. 2.

The collection contains eight specimens of the typical form from Aldabra.

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Genus EUPLŒA, Fabricius.

EUPLŒA MITRA, Moore.

(Plate VIII, fig. 6.)

Euplœa mitra, MOORE, Cat. Lep. E. I. C., I, p. 127.

There are two specimens from Mahé, both females, which agree in the main very well with Moore's description. The habitat of the species is not given by Moore, but Kirby in his Synonymic Catalogue refers the insect with doubt to the Seychelles. If my identification is correct, as I believe it to be, all doubt as to the locality disappears.

Subfamily SATYRINÆ, Bates.

Genus MELANITIS, Fabricius.

MELANITIS LEDA, Linnæus, var. FULVESCENS, Guénée.

Papilio leda, LINNÆUS, Syst. Nat., I, 2, p. 773, No. 151.—CLERCK, Icones, pl. 59, fig. 1.

Melanitis fulvescens, GUÉNÉE, Maill. Reun., II, Lep., p. 15.—GRANDIDIER, Madagascar, XVIII, p. 12, pl. II, figs. 5-7.

All the examples are from the Seychelles—four from Mahé and one from Platte Island.

Family NYMPHALINÆ, Bates.

Genus ATELLA, Doubleday.

ATELLA PHALANTA (Drury).

Papilio phalanta, DRURY, Ill. Ex. Ent., I, pl. XXI, figs. 1, 2.

I cannot separate the specimens before me from examples from India, Ceylon, Burmah, and the Malay Peninsula, from which localities there are long suites in my collection. They all agree in lacking the middle row of spots on the median interspaces, which is found in most specimens from the Indian region. Indian specimens have a row of spots intercalated between the row of spots near the origin of the median nervules and the inner submarginal row. But some Indian specimens lack this row of intercalated spots, and thus agree exactly with the specimens collected by Dr. Abbott. The collection contains three specimens from Aldabra, one from Gloriosa, and one from Mahé.

ATELLA SEYCHELLARUM, new species.

(Plate VIII, fig. 11.)

Male.—Allied to *A. alcippe*, Cramer, and *A. madagascariensis*, H. G. Smith.

The primaries are more pointed and relatively narrower and the secondaries more sharply produced at the extremity of the third median nervule, than in the allied species. The distance from the anal angle to the end of the third median nervule is relatively less than in the other species. The ground color of the upper side of both wings is

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a dark, rich brown, as in *A. madagascariensis*, and the basal area of the primaries is somewhat narrowly, and of the secondaries very broadly, glossed with greenish fuscous. The characteristic markings of the wings are broader and darker than in any other species of the genus. The black marginal borders of the primaries and secondaries are not interrupted as in *A. phalanta* by the extension of the pale lunulate markings outwardly, these lunulate markings being represented by narrow linear marks. On the secondaries the basal half is separated from the outer half by an irregularly curved black fascia, which with the submarginal fascia of heavy black intraneural markings forms a girdle about the four limbal black spots, of which two are located one on either side of the second median nervule, and the other two are located one on either side of the second subcostal nervule. On the under side the ground color is pale ochraceous, not washed with purplish as in *A. phalanta*. The spots and markings of the upper surface reappear upon the lower side, but far less distinctly than in *A. phalanta*, and the black lines on the mesial area of the secondaries are reproduced as pale silvery-blue lines, the four black mesial spots appearing as reddish ocelli pupiled with black.

Expanse of wings, 48 mm.

The species is very distinct, and placed in my collection, which includes long suites of the hitherto described species with the exception of *A. egestina*, Quoy, reveals itself as totally separate from any of them. The description of *A. egestina* given by Godart does not tally with this insect.

Type in the National Museum collection.

Genus JUNONIA, Hübner.

JUNONIA CLELIA, Cramer.

Papilio clelia, CRAMER, Pap. Exot., I, pl. 21, figs. E, F.

One male specimen from Aldabra.

Genus HYPOLIMNAS, Hübner.

HYPOLIMNAS MISIPPUS (Linnæus).

Papilio misippus, LINNÆUS, Mus. Ulr., p. 264.

Four males and one female from Aldabra, and one male from Gloriosa.

Family LYCÆNIDÆ, Stephens.

Genus LYCÆNA, Fabricius.

LYCÆNA ASOPUS, Hopffer.

Lycæna asopus, HOPFFER, Monatsb. K. Preuss. Akad. Wiss., 1855, p. 642, No. 22; Peters's Reise Mossamb., Ins., p. 410, pl. XXVI, figs. 13–15.

Lycæna kama, ♀ TRIMEN, Trans. Ent. Soc. Lond., Ser. III, 1, p. 403.

Lycæna asopus, TRIMEN, S. Afr. Butt., II, p. 16.

Five examples from Aldabra in rather poor condition and notably smaller than specimens from the Cape and from the tropical west coast of Africa.

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LYCÆNA GAIKA, Trimen.[1]

The collection contains five examples from Alphonse Island, six from Mahé, and one from Providence Island.

LYCÆNA TELICANUS, Lang.[2]

Two examples from Mahé, two from Alphonse Island, and six from Aldabra.

LYCÆNA, sp. (?)

The collection contains one rubbed specimen and the half of another from Aldabra, which I can not well determine with such material. The insects are apparently allied on the markings of the under side to *L. telicanus*, Lang, but differ, and are very much smaller than that species. They may represent a new species, but with such specimens it would be rash to venture more than a mere conjecture.

Genus HYPOLYCÆNA, Felder.

HYPOLYCÆNA PHILIPPUS, Fabricius.[3]

One male and three females from Aldabra.

Subfamily PIERINÆ, Swainson.

Genus TERIAS, Swainson.

TERIAS ZOE, Hopffer.[4]

Three specimens of the typical form from Aldabra.

TERIAS DESJARDINSII, Boisduval.[5]

Six specimens from Aldabra.

Genus CALLOSUNE, Doubleday.

CALLOSUNE EVANTHIDES, new species.

(Plate VIII, fig. 9.)

Male.—Allied to *C. evanthe*, Boisduval. The wings on the upper side are white, powdered at the base with grayish scales. The primaries are broadly tipped with orange-red. This orange red space is narrowly bordered with black on the anterior margin, and more widely bordered with black on the outer margin. The black border of the outer margin is produced inwardly for a short distance on each of the nervules, and is inflected inwardly just above the extremity of vein 2, being at this point somewhat widely separated from the outer margin by a white line. A transverse oblique band of black, poorly defined, runs from

[1] For synonymy, see Trimen, S. Afr. Butt., II, p. 50.
[2] For synonymy, see Trimen, S. Afr. Butt., II, p. 69.
[3] For synonymy, see Trimen, S. Afr. Butt., II, p. 118.
[4] For synonymy, see Trimen, S. Afr. Butt., III, p. 16.
[5] For synonymy, see Trimen, S. Afr. Butt., III, p. 24.

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the extremity of vein 2 toward the end of the cell, and serves to delimit the orange-red apical patch from the white inner area of the wing along the lower half of its inner margin. There is a short, pale orange, transverse bar at the end of the cell. The secondaries have the ends of the nervules lightly tipped with black. On the under side the primaries are white, with the orange red of the apical patch faintly showing through from the upper side. There is a minute black spot at the end of the cell. The costa and the apical area are laved with pale yellow, and profusely irrorated with pale-brown spots and strigæ. The secondaries on the under side are pale yellow, profusely covered throughout with pale brown spots and strigæ like those on the primaries. The body is blackish above and pale yellow below. The antennæ are black.

Female.—Like the male, but the black subapical transverse line delimiting the orange-red apical patch on its inner side is in this sex continued across the wing to the costa, instead of terminating, as in the male, before reaching the end of the cell, and there is a black spot at the end of the cell on both the primaries and the secondaries.

Expanse of wings, 28–38 mm.

There are seven males and one female in the National Museum collection, all from Aldabra. Two of the males are very greatly dwarfed.

Genus TERACOLUS, Swainson.

TERACOLUS ALDABRENSIS, new species.

(Plate VIII, figs. 7, 8.)

Male.—The body is grayish above and white below. The wings are white on both sides. The primaries are narrowly edged with gray on the costa, and are also marked on the costa just before the apex with a small black spot. The secondaries on the under side have the costa laved with yellow near the base.

Female.—The female has the wings broader and not so acute at the apex as the male. The apical area on the upper side is broadly black, inclosing six white hastate spots, of which the second from the costal margin is the largest and those below it regularly diminish in size. The sixth in the descending series located between the extremities of veins 2 and 3 is separated from the inner white portions of the wing by an obsolescent grayish shade, which in some specimens is wholly wanting, thus reducing the number of white hastate spots to five. On the under side the secondaries are pale yellow throughout, and the primaries have the costal margin and the apical area of the same color. There is a subapical transverse series of three obscure grayish spots upon the primaries.

Expanse of wings, male and female, 35 mm.

There are five males and four females in the National Museum collection, all labeled as from Aldabra. One of the males is aberrant, displaying a conspicuous black spot at the end of the cell of one of the secondaries on the lower side.

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Family HESPERIIDÆ.

Genus GEGENES, Hübner.

GEGENES GEMELLA (Mabille).

Pamphila gemella, MABILLE, C. R. Soc. Ent. Belg., XXVIII, p. clxxxviii.

The collection contains eight specimens: one from Alphonse Island, four from Platte Island, and three from Mahé.

GEGENES POUTIERI (Boisduval).

Hesperia poutieri, BOISDUVAL, Faune Ent. Madgr., p. 65.

The collection contains one most wretched specimen, from Mahé. There is just enough of the creature upon the pin to make the identification certain.

Suborder HETEROCERA.

Family LITHOSIIDÆ.

Genus UTETHEISA, Hübner.

UTETHEISA PULCHELLA (Linnæus).

Tinea pulchella, LINNÆUS, Syst. Nat., I, p. 534, No. 238 (1758).

There are fourteen specimens in the collection, distributed as follows: Mahé, 2; Gloriosa, 1; Poivre Island (Amirante Group), 3; Aldabra, 4; Platte Island, 4.

Family SPHINGIDÆ.

Genus CEPHENODES, Hübner.

CEPHENODES HYLAS (Linnæus).

Sphinx hylas, LINNÆUS, Mant. Plant., p. 539 (1771).

There is one specimen from Mahé.

Genus PHLEGETHONTIUS, Hübner.

PHLEGETHONTIUS CONVOLVULI (Linnæus).

Sphinx convolvuli, LINNÆUS, Syst. Nat., I, p. 490, No. 6 (1758).

One very poor specimen from Mahé.

Genus ACHERONTIA, Ochsenheimer.

ACHERONTIA ATROPOS (Linnæus).

Sphinx atropos, LINNÆUS, Syst. Nat., I, p. 490, No. 8 (1758).

Two specimens from Mahé.

Group NOCTUÆ.

Family LEUCANIIDÆ.

Genus PRODENIA, Guénée.

PRODENIA LITTORALIS (Boisduval).

Hadena littoralis, BOISDUVAL, Faune Ent. Madgr., p. 91, pl. XIII, fig. 8 (1833).

One rubbed specimen from Mahé which I think, from what remains of the insect, is correctly referable to this widely distributed species.

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Family CARADRINIDÆ.

Genus ILATTIA, Walker.

ILATTIA OCTO, Guénée.

Perigea octo, GUÉNÉE, Noct., I, p. 233 (1852).

There is one specimen, from Providence Island, of this wretched little creature, which has been located in no less than nine different genera by systematists, and described under fourteen different names. It is known to North American students as *Chytoryza tecta*, Grote. For full synonymy, the student is referred to the excellent paper by my honored friend, Dr. Butler, of the British Museum.[1]

Family PLUSIIDÆ.

Genus PLUSIA, Ochsenheimer.

PLUSIA CHALCYTES, Esper.

Noctua chalcytes, ESPER, Schmett., IV, p. 447, pl. CXLI, fig. 3 (1789).

There are two specimens from Mahé which I refer to this species, and which seem to differ from specimens from the south of Europe in my collection, only by being somewhat paler upon the under side of the wings, and destitute of any trace of the fuscous shade which, in the specimens I refer to, is found at the end of the cell and on the outer margins of the wings.

Family OMMATOPHORIDÆ.

Genus CYLIGRAMMA, Boisduval.

CYLIGRAMMA LATONA (Cramer).

Phalæna latona, CRAMER, Pap. Exot., I, 20, pl. XIII, fig. B.

One specimen from Gloriosa Island.

Family OPHIUSIDÆ

Genus GRAMMODES, Guénée.

GRAMMODES STOLIDA (Fabricius).

Noctua stolida, FABRICIUS, Ent. Syst., p. 599.

Three examples, all from Platte Island.

Family DYSGONIIDÆ.

Genus SPHINGOMORPHA, Guénée.

SPHINGOMORPHA CHLOREA (Cramer).

Phalæna noctua chlorea, CRAMER, Pap. Exot., II, p. 12, pl. CIV, fig. C (1779).

Two specimens from Gloriosa.

[1] Proc. Entom. Soc. London, XXXVIII, p. 690.

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Genus ACHÆA, Hübner.

ACHÆA SEYCHELLARUM, new species.

(Plate VIII, fig. 10.)

Male.—Palpi, front, patagia, and upper side of thorax fawn color. The upper side of the abdomen is slightly paler fawn. The under side of the thorax and the abdomen is pale fawn, with the anterior legs outwardly darker brown. The fore wings on the upper side are fawn, marked by an incomplete basal black line succeeded by a heavy zigzag basal transverse line, beyond which in the cell is a small black spot, and at the end of the cell a moderately large ocelliform spot. Beyond the cell, the wing is crossed by a broad black band curving outwardly opposite the end of the cell, and interrupted more or less on the nervules by narrow, pale lines. Beyond this broad band, there are some submarginal cloudings in a double series, succeeded by minute pale marginal spots. The fringes are white. The hind wings on the upper side are pale gray, with the outer half broadly black. The basal area is separated from the black outer area by an obscurely defined transverse whitish line. On the outer margin near the outer angle, at the middle, and just before the anal angle, are conspicuous white spots, of which that on the middle is the largest. On the under side both wings are pale gray. The primaries have the inner margin broadly shining stramineous. There is a conspicuous black spot at the end of the cell, followed by a curved black band running from the costa to vein 2, and succeeded outwardly near its lower end by a broad black shade. The apical area is slightly darker than the rest of the wing. The outer margin is very pale gray. The secondaries have a minute spot at the end of the cell, followed toward the outer margin by three obscure and incomplete curved transverse bands of brown, which are lost in a pale brown clouding, which is most conspicuous near the outer and the anal angles.

Expanse of wings, 55 mm.

Type in the National Museum collection.

ACHÆA SEYCHELLARUM, var. IMMUNDA, new variety.

This variety only differs from the type in the total absence, on the upper side, of the primaries, of all the transverse dark markings, and the somewhat paler tint of the under side, and the effacement of most of the less conspicuous markings of the under surface.

It is well known that in this genus there is great diversity in the markings upon the upper side of the wings, and I have no hesitation in referring the two forms before me to the same species. There are three specimens of the typical form before me in the collection, all males, and all labeled as coming from Aldabra. There are four specimens of the variety, three males and one damaged female, from the same locality.

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Family REMIGIIDÆ.

Genus REMIGIA, Guénée.

REMIGIA CONVENIENS, Walker.

Remigia conveniens, WALKER, Cat. Lep. Het. Brit. Mus., XIV, p. 1507.

One injured specimen apparently belonging to this species. It is labeled as from Mahé, Seychelles.

Group PYRALES.

Genus HYMENIA, Hübner.

HYMENIA RECURVALIS, Fabricius.

Phalæna recurvalis, FABRICIUS, Ent. Syst., III, 2, 237, 407.

Several damaged specimens, one from Aldabra, one from Platte Island, and one from Doros (Amirante Group).

BOTYS, sp. (?)

There are a couple of specimens in rather inferior condition which may be referred possibly to *B. otreusalis*, Walker, but I am not sure of the identification.

BOTYS (?), sp. (?)

There is a dark-colored species of some pyralid genus, probably *Pleonectusa*, represented by a specimen on a pin with a specimen of *H. recurvalis* from Platte Island, and another by itself from the same island, which I can not well determine. They have a wonderfully familiar look, but after grubbing through nearly one thousand species of pyralids in my collection in quest of a name, I give up the task as not worth the time it will take. The species may be new.

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LIST OF THE LEPIDOPTERA COLLECTED IN KASHMIR BY DR. W. L. ABBOTT.

By W. J. HOLLAND, Ph. D.

THE small collection of lepidoptera transmitted to me for determination by the authorities of the United States National Museum is interesting mainly because it adds slightly to our knowledge of the range of two or three species, which, while belonging to the region of which Kashmir forms a part, have not been hitherto distinctly recorded as found there.

Suborder RHOPALOCERA.

Subfamily DANAINÆ.

Genus DANAIS, Latreille.

DANAIS CHRYSIPPUS, Linnæus.

Four typical specimens. Below 5,000 feet.

DANAIS LIMNIACE, Cramer.

Two examples. Below 5,000 feet.

Subfamily SATYRINÆ.

Genus MANIOLA, Schrank.

MANIOLA KASHMIRICA, Moore.

Maniola kashmirica, MOORE, Lep. Ind., II, p. 51, pl. 104, fig. 2.

One mutilated specimen. Below 5,000 feet.

Genus CALLEREBIA, Butler.

CALLEREBIA DAKSHA, Moore.

Callerebia daksha, MOORE, Proc. Zool. Soc. Lond., 1874, p. 266, pl. XLIII, fig. 1; Lep. Ind., II, pl. 117, figs. 2, 2a.

Three specimens. Below 5,000 feet.

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Family NYMPHALINÆ.

Genus MELITÆA, Fabricius.

MELITÆA BALBITA, Moore.

Melitæa balbita, MOORE, Proc. Zool. Soc. Lond., 1874, p. 268, pl. XLIII, fig. 5.

One broken specimen. Below 5,000 feet.

Genus ARGYNNIS, Fabricius.

ARGYNNIS CHILDRENI, Gray.

One specimen taken below 5,000 feet.

ARGYNNIS KAMALA, Moore.

Two specimens. Below 5,000 feet.

ARGYNNIS JAINADEVA, Moore.

A male and a female. Below 5,000 feet.

ARGYNNIS JERDONI, Lang.

Nine specimens. Below 5,000 feet.

Genus PYRAMEIS, Hübner.

PYRAMEIS CARDUI, Linnæus.

Three examples. 5,000–10,000 feet.

Genus VANESSA, Fabricius.

VANESSA KASCHMIRENSIS, Kollar.

Five examples. Below 5,000 feet.

VANESSA CANACE, Linnæus.

One specimen. Above 5,000 feet.

Subfamily LIBYTHÆINÆ.

Genus LIBYTHEA, Fabricius.

LIBYTHEA LEPITA, Moore.

Three specimens. Below 5,000 feet.

Family LYCÆNIDÆ.

Genus LYCÆNA, Fabricius.

LYCÆNA MEDON, Hübner.

One example, female. Over 5,000 feet.

LYCÆNA ARIANA, Moore.

A male and a female. 5,000–10,000 feet.

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LYCÆNA OMPHISSA, Moore.

There are two examples, a male and apparently a female, which I refer with some doubt to this species. They appear to correspond in most particulars with the description given by Moore, and with what is recorded in reference to the species by De Niceville in his work upon the Butterflies of India.[1] Below 5,000 feet.

LYCÆNA GALATHEA, Blanchard.

Four males and one female. Below 5,000 feet.

Genus CYANIRIS, Dalman.

CYANIRIS COELESTINA, Kollar.

Two examples. 5,000–10,000 feet.

Genus THECLA, Fabricius.

THECLA SASSANIDES, Kollar.

Six specimens. Below 5,000 feet.

Genus CHRYSOPHANUS, Hübner.

CHRYSOPHANUS PHLÆAS, Linnæus.

One specimen. Below 5,000 feet.

Subfamily PIERINÆ.

Genus PIERIS, Schrank.

PIERIS DAPLIDICE, Linnæus.

Seven specimens. From below 5,000–10,000 feet.

PIERIS BRASSICÆ, Linnæus.

Four specimens. From below 5,000–10,000 feet.

PIERIS CANIDIA, Sparrmann.

Nine examples. Below 5,000 feet.

Genus COLIAS, Fabricius.

COLIAS EDUSA, var. MYRMIDONE, Esper.

There are two males and two females in the lot sent me for determination. They were mixed with the specimens of the following species by the curator of the Museum, who evidently regarded them as belonging to the same. Below 5,000–10,000 feet.

[1] Vol. III.

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COLIAS HYALE, Linnæus.

There are one male and four females in the lot sent me. From 5,000–10,000 feet. Eighteen specimens of Colias were sent home by Dr. Abbott.

Genus GONEPTERYX, Leach.

GONEPTERYX NEPALENSIS, Doubleday.

One male specimen. Below 5,000 feet.

Subfamily PAPILIONINÆ.

Genus PAPILIO, Linnæus.

PAPILIO MACHAON, Linnæus.

Two examples and a fragment of another. Below 5,000 feet.

PAPILIO PARIS, Linnæus.

Six specimens. Below 5,000 feet.

Suborder HETEROCERA.

Family SPHINGIDÆ.

Genus CEPHENODES, Hübner.

CEPHENODES HYLAS, Linnæus.

Three specimens. Below 5,000 feet.

Family ARCTIIDÆ.

Genus ARCTIA, Schrank.

ARCTIA PERORNATA, Moore.

One damaged specimen. Below 5,000 feet.

Genus CALLIMORPHA, Latreille.

CALLIMORPHA PRINCIPALIS, Kollar.

Three specimens. 5,000–10,000 feet.

Family GEOMETRIDÆ.

Genus URAPTERYX, Leach.

URAPTERYX EBULEATA, Guénée.

One example. Over 5,000 feet.

Group PYRALES.

Genus NOTARCHA, Meyrick.

NOTARCHA AURANTIACALIS, Fischer von Röslerstamm.

One specimen. Over 5,000 feet.

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EXPLANATION OF PLATES.

Plate VII.

Fig. 1. Acræa abbottii, Holland.
2. Argynnis hanningtoni, Elwes.
3. Acræa pharsalioides, Holland.
4. Chrysophanus abbottii, Holland.
5. Terias mandarinulus, Holland.
6. Hepialus keniæ, Holland.
7. Lycæna perpulchra, Holland.
8. Dromitus kilimanjarensis, Holland.
9. Gorgopis abbottii, Holland.
10. Alpenus trifasciata, Holland.
11. Cosuma marginata, Holland.
12. Teracotona clara, Holland.
13. Ogovia tavetensis, Holland.
14. Sozuza stevensii, Holland.

Plate VIII.

1. Conservula minor, Holland.
2. Calliodes pretiosissima, Holland.
3. Metarctia inconspicua, Holland.
4. Gonodela kilimanjarensis, Holland.
5. Gonodela rhabdophora, Holland.
6. Euplœa mitra, Moore.
7. Teracolus aldabrensis, Holland, male.
8. Teracolus aldabrensis, Holland, female.
9. Callosune evanthides, Holland, male.
10. Achæa seychellarum, Holland.
11. Atella seychellarum, Holland.

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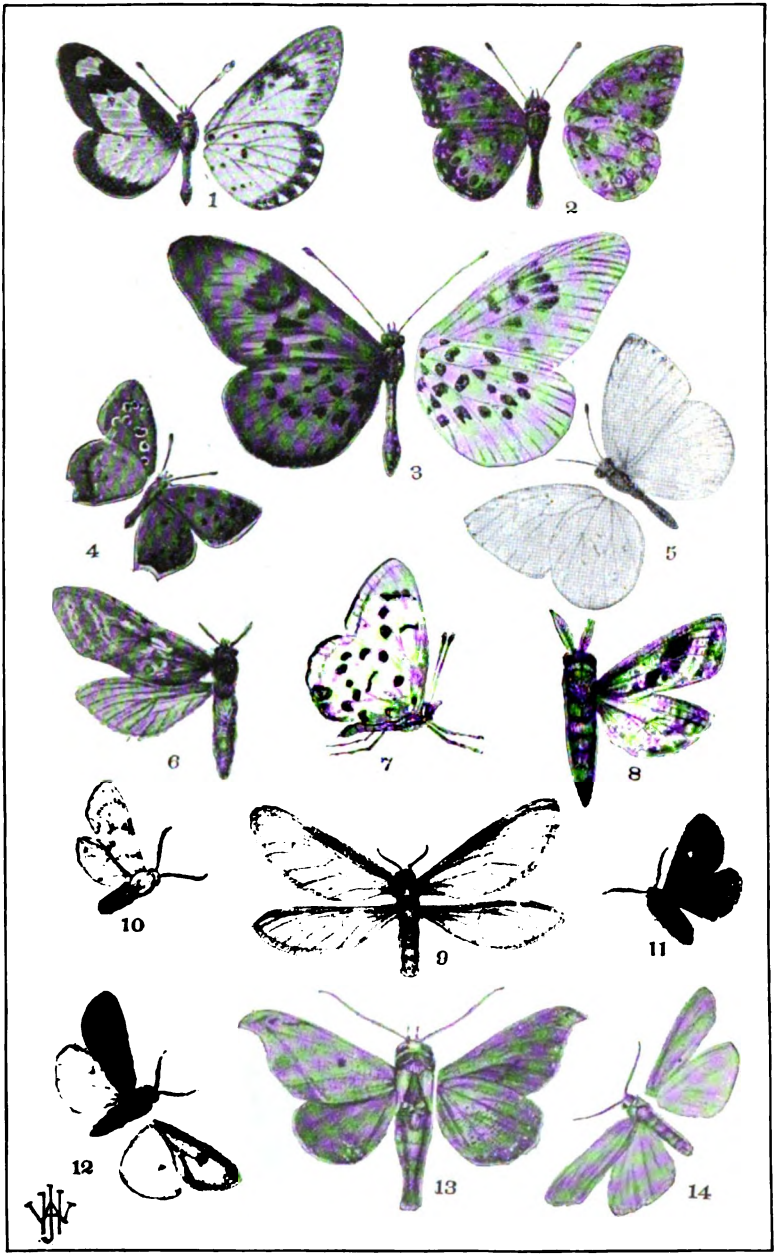

EAST AFRICAN LEPIDOPTERA

Reduced one-tenth

FOR EXPLANATION OF PLATE SEE PAGE 279

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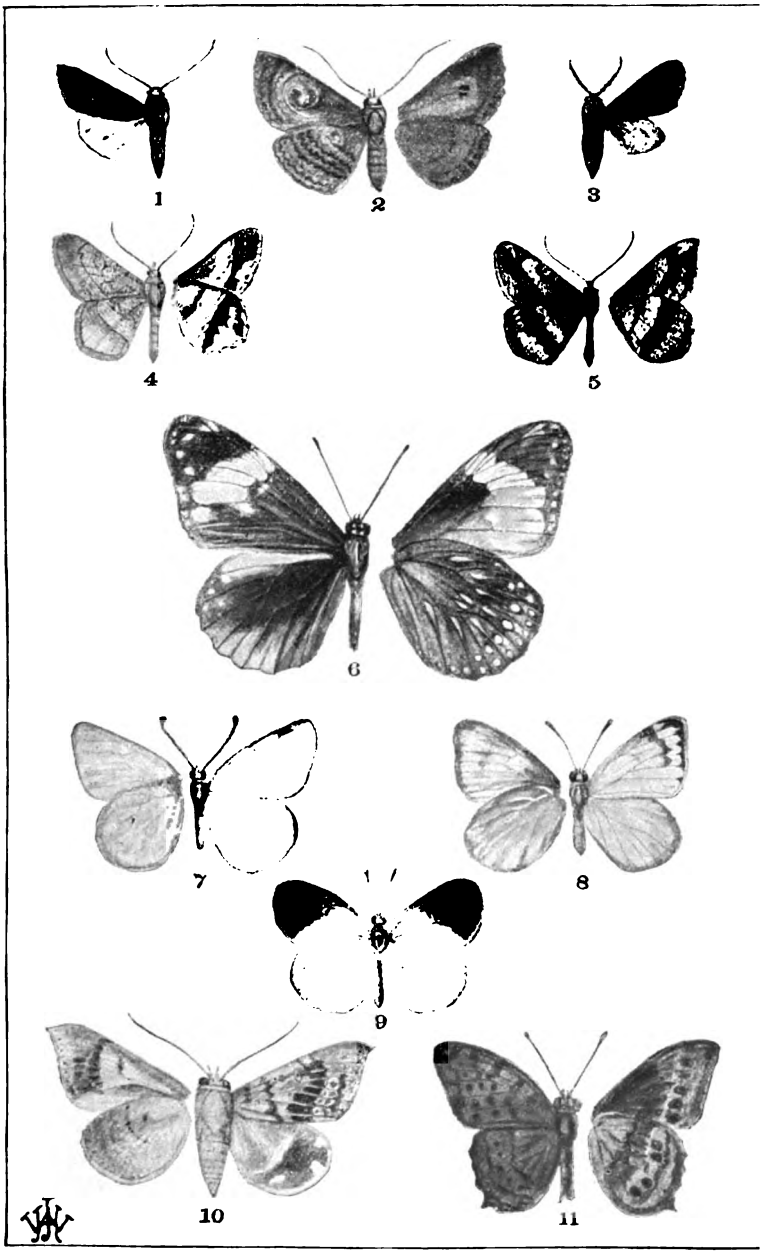

EAST AFRICAN LEPIDOPTERA

Reduced one-tenth

FOR EXPLANATION OF PLATE SEE PAGE 279

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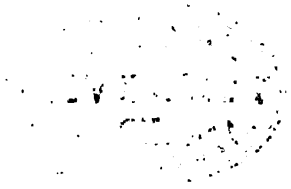

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NOTES ON ASBESTOS AND ASBESTIFORM MINERALS.

By GEORGE P. MERRILL,
Curator of the Department of Geology.

The investigations detailed below are an outgrowth of an attempt at classifying and labeling the "asbestos" collections in the economic series of the geological department of the National Museum. The results seem of sufficient interest to warrant immediate publication, as the final handbook[1] of which they were designed to form a part may yet be delayed some months.

Without going too deeply into a discussion of the origin of the name "asbestos," and the causes which led to its present loosely-defined mineralogical significance,[2] it may be said that as commercially used the name now covers at least four distinct minerals, having in common only a fibrous structure and more or less fire- and acid-proof properties. These minerals are (1) monoclinic amphibole (tremolite), (2) serpentine (amianthus), (3) anthophyllite, and (4) crocidolite. Of these, tremolite and serpentine have long been recognized in fibrous forms, and are as a rule readily distinguishable from one another by the silky fiber and greater flexibility of the last named. Asbestiform crocidolite is well known to most mineralogists, though, so far as the present writer is aware, the South African locality is the only source of the mineral in commercial quantities. That the fibrous form of anthophyllite is also sufficiently common to be commercially used as asbestos, seems not so well understood, though the leading text-books on the subject[3] all mention the mineral as sometimes occurring in fibrous forms resembling asbestos. That a lack of discrimination between fibrous anthophyllite and the true tremolite asbestos should exist is not strange, since to the unaided eye they are often in every way alike, and it is only by microscopic or chemical means that the true nature of the mineral can be made out.

[1] The Nonmetallic Minerals, now in process of preparation.

[2] See "Some Misconceptions concerning Asbestus," by J. T. Donald and A. H. Chester, in the Eng. and Min. Journal for March 18, April 1, and June 10, 1893.

[3] See Dana's System of Mineralogy, latest edition, and Hintze's Handbuch der Mineralogie.

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In the accompanying table (pages 291 and 292) I have brought together all the analyses of the above noted asbestiform minerals that have been made either by R. L. Packard or myself in the department laboratory, as well as such others as can be compiled from available literature. It will be seen that out of the 24 analyses made by ourselves, 12 are anthophyllite, 7 asbestiform tremolite, and 2 uralitic augite. This statement must not, however, be accepted as conveying the idea that anything like the same proportions would hold in another series, since only such samples were selected for our analyses as had not been already satisfactorily determined. In all cases the optical and chemical determinations agree, the mineral giving extinctions parallel with the axis of elongation proving to be anthophyllite, and that with inclined extinctions, tremolite (asbestos) or uralitic augite. This result was not wholly expected, since it was thought that possibly some might be amphibole anthophyllite, *i. e.*, a mineral with the composition of anthophyllite, but monoclinic in crystallization. The angle of extinction given, is that obtained by measuring against the axis of elongation of the fibers, which is doubtless the vertical crystallographic axis.

The size and shape of the fibers in both asbestos proper and anthophyllite is found to be quite variable, but I can not discover that there is any constant difference. The Salls Mountain material (No. 61357, U. S. N. M.) occurs in the form of a massive aggregate of bundles of short radiating fibers, rarely 20 mm. in length. The mineral is soft, of a somewhat brittle nature, but in small fibers very flexible, though scarcely elastic. Under the microscope the interference colors are very faint, scarcely discernible in the smaller fibers; extinction is always parallel with the axis of elongation. The composition is that of a hydrated anthophyllite.

The Nacoochee (White County) material (No. 60842, U. S. N. M.) is of a beautiful snow-white color in the mass, but colorless in single fibers. The fibers are long, smooth, of very uniform diameter throughout, flexible, but breaking with rectangular cross fractures. The fibers not infrequently show a cross parting at right angles to the axis of elongation. The mineral is not at all pleochroic, and the fibers always extinguish parallel with the axis of elongation. The outline of the fiber is polygonal. Other materials from Cleveland, in this same county, are precisely similar, both in physical and chemical properties. The Rabun County (Georgia) material (No. 56351, U. S. N. M.) is colored brownish by oxidation, and, on casual inspection, is coarse-fibered. The fibers are long, somewhat stiff, but flexible, though not elastic. The ultimate product of fibration, obtained by rolling the material between the thumb and fingers, has a somewhat splintery look under the microscope, the thin fibers, some 0.002 mm. in diameter, running out to a point at the end. Extinction parallel with axis of elongation.

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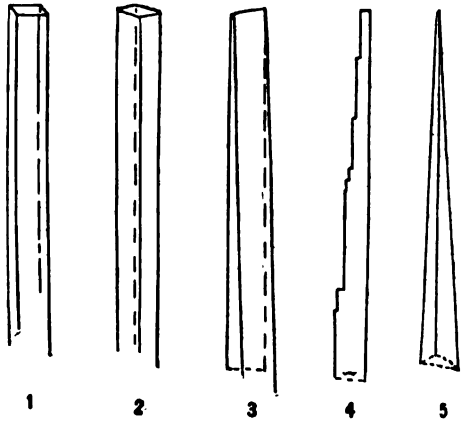
The material from Alberton, Maryland (No. 62604, U. S. N. M.), is quite similar in general appearance to that from Cleveland, occurring in the form of fibrous bundles 12 to 18 inches in length. The individual fibers are very smooth and polygonal in outline, and give parallel extinctions. The ultimate composition, it will be observed, is essentially the same as that of Nacoochee. Another variety, occurring in the limestone just above Alberton, is pure white in color, finely fibrous, and when wet is easily reduced to a condition that can only be described as *pulpy*, like wet paper. The fibers extinguish always parallel with the axis of elongation, but its exact mineral nature has not been as yet worked out (see Analysis 40 in accompanying table).

The Carbon County (Wyoming) material (No. 62090, U. S. N. M.) is of the same general nature as No. 62604. The material from Mitchell County, North Carolina (No. 50876, U. S. N. M.), is in the form of bundles of parallel-lying, long, soft and silky fibers, white in color, and easily reduced to a fine, silky powder, without appreciable grit, by rubbing between the thumb and finger. The extinction colors are very faint, but always parallel with the axis of elongation. No appreciable pleochroism. The fibers show occasional cross partings, causing them to break with sharp, straight fractures. The actual size of the fibers—that is, the diameter—is indefinite, since there seems no limit to further subdivision. The smallest actually measured was 0.002 mm. Down to a diameter of 0.004 mm. the fibers are of quite uniform diameter throughout their length and in the form of square or slightly compressed prisms (see Figs. 1 and 2). The smaller sizes frequently taper off to wedge-shaped forms, as shown in Fig. 3. All show extinctions and plane of optic axis parallel with the axis of elongation.



ASBESTOS FIBERS
(Enlarged)

Two samples were examined, labeled as from Franklin County, North Carolina. The first, from the Brush collection at New Haven, kindly submitted by S. L. Penfield, was in the form of somewhat stiff and brittle bundles of a slight brownish color. The material was easily reduced to fibrous form by thumb and fingers, but the fibers were quite brittle. Its composition is that of normal anthophyllite, closely resembling that of Mitchell County, above noted. The second sample (No. 44232, U. S. N. M.), concerning the identity of which there at first seemed some doubt, proved microscopically identical and was not analyzed.

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A sample marked as from Tallapoosa County (?), Alabama, was received from Prof. Albert H. Chester, of Rutgers College, New Jersey. It resembles very closely that of Mitchell County, North Carolina, and occurs in fibrous bundles ten or more inches in length. This is also anthophyllite, as shown by its chemical and optical properties. Material received from Warrenton, Warren County, the same State, is of pure white color, excepting where stained externally by iron oxide. It is reduced readily by the thumb and fingers to fine, soft and silky fibers, which do not differ materially from others mentioned.

The San Diego material occurs in the form of hard, compact bundles, somewhat difficult to reduce to a fibrous condition, but capable of almost indefinite subdivision. Under the microscope the fibers, either singly or in bundles, give parallel extinctions. The bundles, even though containing thousands of individual fibers, conduct themselves as crystal units, the entire bundle behaving optically as a single fiber. The larger fibers, although clear and compact, without indication of having in themselves a fibrous structure, yet manifest their capability of further subdivision by steplike ends, as in Fig. 4, where the rise of each step represents the diameter of a fiber which has been separated from it.

As above noted, I fail to find any certain means of discrimination between the anthophyllite and asbestos fibers by their shape alone. Optically there is, of course, a well-defined distinction, the asbestos fibers giving extinction angles from 0° to 20°, according to their orientation. These fibers, like those of anthophyllite, are angular in outline, often compressed, at times of a very uniform diameter throughout their entire length, or again tapering very gradually to a triangular point, as shown in Fig. 5, which is drawn from a fiber of asbestos (No. 62550, U. S. N. M.) found in the "soapstone" quarries of Alberene, Virginia. The asbestos from Chester, South Carolina (No. 73462, U. S. N. M.), is of a gray color, short-fibered, and rather brittle. The individual fibers often show the cross partings, but have frequently acute terminations and a splintery appearance. The material in Analysis 20 (see accompanying table), marked as from Cow Flats, New South Wales, it will be observed, differs radically from that of the "asbest-forminge mineral" from the same locality as given by Hintze (Analysis 26). Our material is of a beautiful white, silky appearance, very finely fibered, and showing under the microscope clear, colorless, straight fibers of very uniform size throughout, ranging from 0.008 down to 0.002 mm. or even smaller, and giving extinction angles varying from 0° to 17°. The Corsican material is very similar, as is also that of Pylesville, in Harford County, Maryland (noted later), excepting that the last is a trifle more brittle and of a grayish hue.

That from Aston, Delaware County (obtained from the Boston Society of Natural History, through the kindness of Prof. W. O. Crosby), occurs in short, beautifully silky forms, sometimes almost feltlike, or

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again in the form of compact bundles of flat fibers of a grayish hue, several inches in length. The larger bundles found at this locality frequently show rude cross partings, indicative of a rupturing through shearing agencies, the clefts thus formed being filled by other secondary minerals. The significance of this fact is noted later. The material from Idaho (Analysis 32) can scarcely be considered a true mineral species, being partially decomposed by cold dilute hydrochloric acid, the solution reacting for alumina and magnesia, while the insoluble residue consists of pure white, brittle fibers, in the form of flat bundles, showing to the naked eye a peculiar crimping extending diagonally across the plates. The two samples from Nahant and Malden, Massachusetts, received from Prof. W. O. Crosby, occur in diabase, the fibers running oblique or parallel with the walls of the "vein." That from Nahant is a dull, light-green-gray, platy mineral, shredding up readily into flattened bundles of fibers which lie with their greatest diameters in one general plane. The fibers, under the microscope, are very uneven in diameter and splinterlike, terminating in acute points. There seems almost no limit to fibration, bundles not over 0.004 mm. in diameter being made up of a large number of short, splinterlike fibers, with free ends frequently projecting like the broken strands in an old rope. Fibers were measured down to 0.001 mm. in diameter, but smaller exist. Small flattened fibers, the fraction of a millimeter in diameter, give extinction angles, measured against the edge, of 7°, and show indistinctly the emergence of a bisectrix a little to one side, facts at once suggestive of cleavage splinters parallel to the prismatic faces. Measurements on a number of small individual fibers show extinction angles ranging from 0° to 17°. The Malden material is very similar, but the fibers are longer and more uniform in diameter. The composition and optical properties of both are such as to relegate them to the "uralites" rather than to true asbestos, though their fibrous structure is none the less suggestive from our present standpoint.

A platy, dull greenish, soft, and rather brittle mineral found at Roxbury, Massachusetts, under similar conditions, shows under the microscope stout, faintly yellowish, and pleochroic columns, with frequent cross partings which give extinction angles as high as 22°. The material is doubtless actinolite, and was not analyzed.

Concerning the possible cause of the fibrous structure of these minerals, existing literature is strangely silent, though there are numerous references to the occurrence of asbestos as a secondary mineral. Thus Blum describes[1] the conversion ("umwandlung") of an augite from Pitkaranda, in the Ladoga-See, into an asbestos-like hornblende, the process being evidently akin to uralitization. He finds also a fibrous intermediate product having the following composition: SiO_2, 45.57 per cent; Al_2O_3, 3.00 per cent; Fe_2O_3, 19.73 per cent; CaO, 4.40 per cent; MgO, 23.40 per cent; H_2O, 2.00 per cent. In the augites from the Brozza-

[1] Die Pseudomorphosen des Mineralreiches, 1843.

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Thal of Piedmont he also finds all transition stages between compact augite and asbestos. The first stages of the transformation are indicated by a tissue of fine fibrous material on the terminal planes, whereby the crystal form becomes obscured, the whole ultimately becoming converted into a bundle of flexible fibers with a silky luster. Unfortunately he gives no analyses to show how this "asbestus" differs, if at all, from the original augite. E. Schumacher also describes[1] the alteration of diopside into asbestos in a manner quite analogous to that of augite into uralite. The secondary asbestos thus sometimes forms parallel-lying fibers a decimeter in length, or "verworren faserigen" masses. The material occurs in a granular limestone. No analyses are given, the determinations being based on optical properties; nor is there given any suggestion as to the cause of the transformation.

Before going further, the writer should state that the idea that the fibrous structure might be but an extreme phase of uralitization, produced by shearing, was adopted very early in the work of this investigation, and in perusing the literature and making his own observation, it has always been with this in mind. Both literature and observation support this idea to a limited extent, as will be noted as we proceed.

In his work on the Mineralogy of Scotland, Professor Heddle describes[2] an "amianthus" of unusual if not unrivaled excellence as occurring in the deep-cut "goes" on the eastern coast of the Balta Sound, in the Shetland Islands. The length of the fiber varies from 4 to 12 inches, and the mineral is sufficiently soft to be readily rubbed down to an unctuous pulp between the thumb and fingers. It occurs in thin rifts in gabbro, and though not definitely so stated, the descriptions are such as to lead one to infer that the fibration may be but a phase of schistosity. Indeed, he describes a highly fissile schistose mineral of essentially the same chemical composition, which is convertible into a fibrous form by beating, and which passes into the asbestos on exposure, or, as he expresses it, the "amianthus" seems to "grow out of the solid and fissile stone." This is almost precisely the relative condition of the fibrous and compact anthophyllite at Alberton, Maryland, to be described later. The composition of this "amianthus" is given in Analysis 34, showing it to be a true asbestos. A second occurrence at Portsoy, described by this same authority, is of interest as showing the mineral in veins an inch in width in a gabbro passing into serpentine, and with fibers lying transversely to the veins, an unusual thing, he says, "as regards asbestus." Although occurring in serpentinous rocks, this also is a true asbestos, as indicated by Analysis 36. The "hydrous anthophyllite" first noted by Jameson, and afterwards by Professor Heddle, as occurring at the Free Church of Milltown, in Glen Urquhart, Scotland, is described as an alteration product after asbestos. The

[1] Zeit. der Deutschen Geol. Gesell., XL, 1878, p. 494.

[2] Mineralogical Magazine, II, 1878; also Trans. Royal Society of Edinburgh, XXVIII, 1877–78, p. 502.

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fibers were some 4 or 5 inches in length, of a green-brown color, silky luster, and great toughness. These also ran transversely to the walls of the vein. The mineral was subsequently shown by Lacroix to be monoclinic in crystallization, and hence tremolite, rather than anthophyllite, although the analysis as given[1] (No. 33) shows it to be very low in lime. F. von Sandberger describes[2] asbestos and epidote, so associated as to indicate that they result from the alteration of hornblende and augite, in South Tyrol, in Nassau near Hof, and in Pribram.

The above enumerated observations, it will be observed, throw little light upon the subject, other than indicating that the mineral is a secondary product after augite or hornblende. My own observations in the field are limited to three localities, in all of which indications as to the secondary nature of the mineral, as well as to the probable efficacy of shearing, were unmistakable. These localities are at the well-known "soapstone" quarries of Alberene, in Albemarle County, Virginia, and near Alberton, in Howard County, Maryland.

The "soapstone" at the first-named locality is not a pure steatite, but rather an admixture of various alteration products, among which a colorless tremolite and light-green talc are most conspicuous.[3] What the original rock may have been is not apparent from a study of thin sections, but the appearance in the field is such as to suggest it to have been a pyroxenite. It occurs in the form of a broad dike or sheet, parallel and dipping with the gneiss (?) in which it is inclosed, and, as displayed in the quarry opening, is traversed by numerous irregular veins of coarsely crystalline calcite. The rock is very massive, in general appearance eminently suggestive of an eruptive pyroxenite which has undergone extensive hydration and carbonatization, whereby a considerable portion of its calcium has separated out in the form of calcite. As is almost invariably the case in rocks of this class, the mass is traversed by numerous joint planes, some of which are pronouncedly slickensided. Asbestos, as found, is always along these slickensided zones, with fibers parallel to line of movement. The material is, as a rule, in the form of thin plates or sheets, rarely over 10 mm. in thickness, but perhaps several feet in breadth, which bear every evidence of compression, accompanied by a shearing movement whereby the material is drawn out into a series of laminæ and the laminæ again into fibers. In one instance the material was fibrous (asbestiform) only where it had been subjected to a sharp crimping process, such as would result from the impinging of the end of one block against another at a considerable angle, accompanied by a slight lateral movement. The physical and chemical properties of the fibrous mineral are those of true asbestos (Analysis 12).

[1] Trans. Royal Society of Edinburgh, XXVIII, 1877-78, p. 531.

[2] Neues Jahrb. für Min., etc., 1888, I, pt. 3, p. 208.

[3] A chemical analysis of the stone, by R. L. Packard, yielded SiO_2, 39.06 per cent; Al_2O_3, 12.84 per cent; FeO, 12.93 per cent; CaO, 5.98 per cent; MgO, 22.76 per cent; ignition, 6.56 per cent. Total, 100.13. All iron calculated as FeO.

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At the second locality above mentioned, the asbestos (fibrous anthophyllite, Analysis 9) occurs along a slickensided zone between a schistose actinolite rock on the north, and a dark, massive, impure serpentine on the south. Soil and decomposition products obscure the outcrops, so that observations are limited to an abandoned shaft and a few shallow prospect holes. The evidences of movement are everywhere abundant in the form of slickensided, pinched-out masses of serpentine, sometimes more or less fibrous. The anthophyllite occurs only along the line of disturbance, and in two forms—the one fibrous, asbestos-like, and of a white color; the other also fibrous, but in compact masses, with sharp cross fracture, so that the material as taken out bears a striking resemblance to a fine-grained hard wood, sawed and split for the fire. The color of this variety is a dull yellowish brown; translucent. By beating, it is readily reduced to a fibrous condition, though the fibers are brittle. On weathering it appears to undergo a spontaneous fibration quite suggestive of the Balta "amianthus" described by Professor Heddle (ante, p. 286). What the origin of this serpentinous rock may have been, is not here apparent, but from its locality it seems safe to assume it to be an altered form of the gabbros or peridotites described by Williams.[1] This being the case, the closing remark made by Dr. Williams in his paper, though referring to a different locality, is at least suggestive. He says: "It seems possible that the asbestos deposits of Baltimore County (*e. g.*, like the one near Elysville) may likewise be the results of the alteration of original pyroxenic masses."

Just below the western edge of the lower bridge of the Baltimore and Ohio Railroad across the Patapsco, at this same place, is another, the third deposit, which has come under the writer's observation. This, though small, offers some interesting distinctive features.

The rock here is a granular, micaceous, magnesian limestone, occurring in narrow beds intercalated in the gneiss, and standing nearly on edge, with an approximately east and west strike. As exposed, the rock is locally traversed at varying angles across the bedding with sharp joint planes, in some cases so fine as to be scarcely distinguishable, the walls being in almost perfect contact, or again separated from one another by a slight space, so far as observed never exceeding an inch, and usually much less. The walls of these joint planes are vertically grooved and striated, indicative of a relative movement in this direction, which was, however, presumably slight. In nearly every case noted, the walls of these joint planes are sporadically coated with thin films of a pure white asbestos-like mineral, which fills the entire space, and is always arranged with its fibers lying in a direction parallel with the striations, or line of movement. Optical examination shows the mineral to be orthorhombic. Chemical analysis (No. 40) shows it to be a mineral of somewhat anomalous composition, and

[1] Bull. No. 28, U. S. Geol. Survey, 1889, p. 59.

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needing more study. It is mentioned here only on account of its bearing upon the subject in hand.

The writer has elsewhere noted[1] the efficacy of pressure and shearing in the production of fibrous serpentine (as well as calcite). The fibrous serpentine used as asbestos occurs, however, under such conditions as to preclude any such possibility of origin. As is well known, this mineral is found in what are simply cracks rather than true veins, with fibers standing at right angles with the walls, and under such conditions that any lateral movement on the part of the walls themselves was simply impossible. The material is doubtless a reproduction on a large scale of the process so frequently seen in thin sections, where olivines and other magnesian silicates undergo serpentinization. The remarks made here have only a slight bearing upon this mineral.

Résumé.—The points brought out in this paper and the suggestions advanced are (1) that a very considerable proportion of the mineral in commercial use, and labeled as asbestos in mineral cabinets, is in reality anthophyllite,[2] and (2) that the fibrous structure in this case, and that of the true asbestos as well, is due, in many instances at least, to a process of shearing—is, in fact, an exaggerated form of the process of uralitization. The fibers are drawn out along the plane of the vertical axis only, the parting or line of separation between individual fibers taking place mainly along cleavage lines, each one being, therefore, an elongated prism bounded by cleavage faces, but with form somewhat compressed or otherwise distorted by pressure. The broad faces on the fibers will therefore correspond to the faces of the unit prism.[3] The fact that the fibers do not in all cases run even approximately parallel to the walls of the inclosing rock is not necessarily opposed to the view. Owing to a lack of homogeneity in a rock mass subjected to a compressive force, there may be developed at an early stage, a series of short, step-like folds bordering closely upon, or perhaps passing into faults, in which the materials forming the yielding portion of the mass may be ground to powder, crimped, puckered, or even rendered fissile, or fibrous, according to their individual qualities. In such cases, the fibers may stand, relative to the inclosing, more resisting rock masses, in all positions short of at right angles.

[1] On the Serpentine of Montville, New Jersey, Proc. U. S. Nat. Mus., XI, 1888, p. 105.

[2] Penfield states (Am. Jour. Sci., XL, Nov., 1890, p. 394), in speaking of the occurrence of anthophyllite, "Many specimens which may be seen in collections labeled anthophyllite will be found, when examined with the microscope, to be fine fibrous or radiated varieties of hornblende." My own observations, as here noted, are quite to the contrary, it being much more common to find fibrous anthophyllite labeled asbestos than the reverse.

[3] See description of Nahant material, p. 285.

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If the foregoing is correct, it may seem, on first thought, that we should find asbestiform augites, enstatites,[1] and other members of the pyroxene group. This does not necessarily follow, since these minerals, as is well known, are peculiarly subject to alteration under conditions of strain, giving rise to actinolitic, tremolitic, and talcose products. These may or may not be asbestiform, according to local conditions. It is my present belief that the asbestos form is never a result of original crystallization, but is always secondary, the original mineral doubtless being an orthorhombic or monoclinic pyroxene, or perhaps an amphibole. The references made to the works of Blum, Heddle, Sandberger and others, in the earlier parts of this paper, seem to point to this conclusion. It is possible in such cases that the mineral derived from the rhombic magnesian pyroxenes may take the form of anthophyllite, and those from monoclinic lime-magnesian pyroxenes that of tremolite. Such a rule can scarcely be considered as universal, since in many cases the mineral undergoes more or less chemical as well as molecular alteration under these conditions. The absence of appreciable quantities of alumina in the asbestos proper is perhaps the strongest argument against its derivation from augite or other aluminous pyroxenes, though it is doubtless to such an origin that we can trace the uralites from Nahant and Malden.

There is ample field here for further observation, and should this paper be effective in causing collectors to note more carefully than heretofore, not merely where the mineral occurs, but how it occurs and with what associations, it will serve at least one good purpose.

[1] Dana, on p. 389 of his "System of Mineralogy," latest edition, mentions the possibility that "some asbestus may properly belong to the pyroxene group." It is evident that, with the possible exception of the uralites from Malden and Nahant, none of the samples examined by the writer can be referred to the monoclinic pyroxenes, though on strictly chemical grounds many of those called anthophyllite might equally well be called enstatite.

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Analyses of asbestiform minerals.

No.	Locality.	Mineralogical nature.	Extinction angle.	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	MnO	K_2O	Na_2O	Ign.	Totals.	Authority.
			°												
1	Salls Mountain, Georgia (61357).	Anthophyllite	0	57.12	0.75	.....	6.36	.....	29.44	.....	*	*	5.47	99.14	R. L. Packard.
2	Nacoochee, Ga. (60842)	do	0	57.73	.72	.....	8.61	0.08	28.77	.....	0.14	0.57	2.52	.....	Do.
3	Rabun County, Ga. (56351)	do	0	56.52	3.57	.....	10.08	Trace.	27.13	.....	*	*	2.96	100.26	Geo. P. Merrill.
4	Tallapoosa County (?), Ala.	do	0	55.92	3.69	11.00		.60	26.33	.....	*	*	2.40	99.94	Do.
5	Lenoir, Caldwell County, N. C.	do	0	56.21	2.78	.....	8.58	.82	28.95	Trace.	*	*	2.23	99.31	Do.
6	Warrenton, Warren County, N. C. (62748).	do	0	57.00	.....	10.32	.....	Trace.	29.98	.....	*	*	2.29	99.59	Do.
7	Franklin, N. C. (44232)	do	0	54.79	.....	13.65	.....	.....	28.52	.....	*	*	2.55	99.51	Do.
8	Mitchell County, N. C. (50876).	do	0	59.00	.91	.....	6.09	.45	29.90	.....	.43	.68	2.35	99.81	R. L. Packard.
9	Alberton, Md. (62604)	do	0	56.75	1.54	.....	10.76	.10	27.46	Trace.	*	*	2.88	99.49	Do.
10	Carbon County, Wyo. (62090).	do	0	54.56	1.47	.....	12.39	1.86	25.28	.....	*	*	2.95	99.51	Geo. P. Merrill.
11	San Diego, Cal. (67001)	do	0	57.31	1.57	.....	7.06	.....	30.24	.....	*	*	2.73	98.91	R. L. Packard.
12	Albemarle County, Va. (62550).	Amphibole, var. asbestos.	0–16	56.26	1.81	.....	6.40	11.98	20.85	Traces.	*	*	2.65	99.95	Do.
13	Parkton, Md. (8536)	do	0–15	56.96	.52	.....	1.12	13.84	23.90	.....	*	*	2.37	98.71	Geo. P. Merrill.
14	Roanoke, Va. (5694)	do	0–15	55.81	1.66	.....	6.81	12.74	21.09	.....	.....	.....	1.81	99.92	R. L. Packard.
15	Chester, S. C. (73462)	do	0–15	54.66	3.72	.....	6.83	12.81	19.87	Traces.	*	*	2.28	100.17	Geo. P. Merrill.
16	Pylesville, Harford County, Md.	do	0–15	56.76	.....	.....	3.10	12.75	23.85	.....	*	*	2.68	98.94	Do.
17	Aston, Delaware County, Pa. (62754).	do	.....	53.42	.....	.....	.....	13.42	22.85	.....	*	*	4.36	98.05	Do.
18	Staten Island, New York	do	.....	52.50	.....	.....	11.82	.....	30.73	.....	.....	.....	2.25	100	Hintze, p. 1241.
19	Zillerthal, Tyrol	do	0–15	55.08	1.64	.....	4.57	14.65	22.56	0.81	.....	.....	2.39	100.4	Hintze, p. 1235 (av of 4 dets.).
20	Cow Flats, Bathurst, New South Wales (62450).	do	0–15	54.75	1.21	.....	2.79	13.99	22.93	Traces.	*	*	2.58	98.25	Geo. P. Merrill.
21	Corsica (82259)	do	0–17	56.72	.545	.....	1.73	14.72	23.63	Traces.	*	*	2.33	99.67	Do.
22	Zillerthal	Amphibole, var. mountain cork.	.....	57.20	.....	.....	4.37	13.39	22.85	.....	.....	.....	2.43	100.24	Dana, p. 395.
23	Frankenstein, Silesia	Amphibole, var. asbestos.	.....	57.09	.....	.....	2.46	13.39	23.68	.13	.....	3.14	.17	100.66	Do.
24	Cunsdorf, Saxony	do	.....	57.98	.58	.....	6.32	12.95	22.38	.....	.....	.....	.....	100.21	Hintze, p. 1234.
25	Taberg, Sweden	do	.....	59.75	.....	.....	3.95	14.25	21.10	.31	Fl.1.16	.....	.....	100.52	Hintze, p. 1238.
26	Cow Flats, New South Wales.	do	.....	49.45	9.09	16.33	5.15	11.97	Trace.	4.39	.....	.....	3.03	100.01	Hintze, p. 1240.
27	Bolton, Mass	do	.....	58.80	.....	.....	3.05	16.47	22.23	.....	.....	.....	.....	100.55	Hintze, p. 1242.

* Not determined.

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Analyses of asbestiform minerals—Continued.

No.	Locality.	Mineralogical nature.	Extinction angle.	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	MnO	K_2O	Na_2O	Ign.	Totals.	Authority.
			°												
28	Malden, Mass		0–17	48.60	6.64	.....	18.23	12.55	9.52	.....	.....	.....	2.85	98.39	Geo. P. Merrill.
29	Nahant, Mass		0–17	51.58	1.88	.....	14.99	9.72	16.65	.....	.....	.....	4.98	99.8	R. L. Packard.
30	Mexico		0–20	55.48	2.01	12.32	.....	10.35	17.23	.....	.....	1.54	1.47	100.40	Bauer, Neues Jahrb., Vol. 1, 1882, p. 159.
31	South Africa (50877)	Crocidolite	0	52.11	1.01	20.62	16.75	.....	1.77	.....	.....	6.16	1.58	99	Dana, p. 400.
32	Idaho (49521)		.....	53.28	.....	.....	.....	None.	22.87	.....	.....	.....	19.53	98.97	Geo. P. Merrill.
33	Glen Urquhart, Scotland	Amphibole, var. asbestos.	.....	47.721	3.837	.176	5.741	5.64	28.745	.159	.186	.264	7.648	100.117	M. F. Heddle.
34	The Balta, Scotland	do	.....	56.153	1.539	.388	3.111	11.716	22.461	.769	.188	.692	2.5	99.517	Do.
35	Shinness, Sutherland, Scotland.	do	.....	56.864	.232	.484	2.124	12.535	23.923	.23	.437	.538	2.325	99.866	Do.
36	Portsoy, Scotland	do	.....	56.307	.77	.527	2.323	12.578	23.307	.153	.439	.633	2.941	99.978	Do.
37	Italy	Fibrous serpentine, amianthus.	0	40.30	.....	2.27	.87	.....	43.37	*	.....	.....	12.72	100.53	J. T. Donald.
38	Canada	do	0	40.57	.....	.90	2.81	.....	41.50	.....	.....	.....	13.55	99.33	Do.
39	Victoria, British Columbia	do	0	41.95	.....	.....	2.81	.....	41.62	.....	.....	.....	14.85	100.23	Geo. P. Merrill.
40	Alberton, Md. (62778)	Hydrous antho-phyllite. (?)	0	51.84	.....	1.51	.....	.....	24.54	*	0.25	0.45	20.18†	98.77	Do.

* Not determined.

† H_2O at 110°, 10.55 per cent; at bright, red heat, an additional loss of 9.63 per cent.

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PRELIMINARY DESCRIPTION OF SOME NEW BIRDS FROM THE GALAPAGOS ARCHIPELAGO.

By ROBERT RIDGWAY,
Curator of the Department of Birds.

DURING the final elaboration of my monograph of the birds of the Galapagos Archipelago,[1] the necessity of again examining some of Dr. Baur's specimens became evident. These were kindly lent me by Dr. Baur, and have been most carefully compared. As a result I find myself compelled to describe the following as new, it being impossible to identify them with any of the forms already named.

GEOSPIZA PACHYRHYNCHA, new species.

Specific characters.—Similar to *G. strenua*, Gould, but bill much thicker and broader at the base than in that form, in this respect nearly or quite equaling *G. magnirostris*, Gould. Exposed culmen, plus 0.90 inch;[2] depth of bill at base, 0.88; width of mandible at base (across chin), 0.70; gonys, 0.40.

Range.—Galapagos Archipelago (Tower Island, collected by Baur and Adams. Type in Dr. Baur's collection).

GEOSPIZA FATIGATA, new species.

Specific characters.—Similar to *G. intermedia*, Ridgway, of Charles Island, but slightly larger, with the bill, legs, and toes decidedly longer. Wing, 2.65–2.82 inches; tail, 1.65–1.73; culmen, 0.82–0.89; depth of bill at base, 0.40; width of mandible at base (across chin), 0.35–0.39; tarsus, 0.85–0.90.

Range.—Galapagos Archipelago (Indefatigable Island, collected by Habel, Townsend, Baur and Adams; ?? Chatham Island, collected by Townsend).

Type.—No. 116048, U. S. N. M., male adult, Indefatigable Island, April 12, 1888; collected by C. H. Townsend.

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[1] See Proc. U. S. Nat. Mus., XVII, 1894, p. 357.

[2] The measurements here given are taken from a drawing, the specimens having been returned to Dr. Baur.

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The specific name is suggested by the tedious character of the work involved in discriminating the forms of this extremely difficult group of birds.

CAMARHYNCHUS BINDLOEI, new species.

Specific characters.—Similar to *C. habeli*, Sclater and Salvin, of Abingdon Island, but rather larger, with decidedly larger bill, the latter with culmen much less compressed. Adult, male (type): Wing, 2.92 inches; tail, 1.82; culmen, 0.68; depth of bill at base, 0.31; gonys, 0.33; width of mandible at base, 0.45; tarsus, 0.85; middle toe, 0.60.

Range.—Galapagos Archipelago (Bindloe Island).

Type in collection of Dr. G. Baur.

CAMARHYNCHUS COMPRESSIROSTRIS, new species.

Specific characters.—Adult male unknown. Adult female similar to that of *C. psittaculus*, Gould, but smaller, with the bill much narrower, more compressed, and with straighter culmen; basal width of mandible (across chin) less than length of gonys, instead of greater, and basal depth of bill less than length of maxilla from nostril. Measurements of type: Wing, 2.57 inches; tail defective; culmen, 0.60; basal depth of bill, 0.40; gonys, 0.32; basal width of mandible, 0.29; tarsus, 0.90; middle toe, 0.60.

Range.—Galapagos Archipelago (Jervis Island).

Type No. 471, collection of Dr. G. Baur, Jervis Island, August 8, 1891.

CAMARHYNCHUS INCERTUS, new species.

Specific characters.—(Adult male unknown.) Adult female most like that of *C. compressirostris*, of Jervis Island, but smaller (the bill especially), with upper parts brighter olivaceous and under parts distinctly yellowish buff. Similar in color to *C. salvini*, Ridgway,[1] of Chatham Island, but much larger. Measurements of the type: Wing, 2.50 inches; tail, 1.50; culmen, 0.53; gonys, 0.29; basal width of mandible, 0.29; tarsus, 0.82; middle toe, 0.57.

Range.—Galapagos Archipelago (James Island).

Type No. 521, collection of Dr. G. Baur, James Island, August 13, 1891.

[1] *Camarhynchus salvini*, Ridgway, Proc. U. S. Nat. Mus., XVII, No. 1007, Nov. 15, 1894, p. 364.

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THE CLASSIFICATION AND GEOGRAPHICAL DISTRIBUTION OF THE PEARLY FRESH-WATER MUSSELS.

By CHARLES T. SIMPSON,
Aid, Department of Mollusks.

THE NAIADES, or pearly fresh-water mussels, have a universal distribution throughout the ponds, lakes, and streams of the world, not only on the continents, but on most of the larger and some of the smaller islands. Some of the genera have probably extended back with but little change to the beginning of Mesozoic or possibly well into Paleozoic time; hence their study is an extremely interesting one, which may help us in obtaining a knowledge of the distribution of other life, and the mutations of land and sea in time past.

I. CLASSIFICATION OF THE NAIADES.

In 1806[1] and 1812[2] Lamarck established the family of Nayades, which he afterwards changed to Naiades,[3] and in which he placed two genera, *Unio* and *Anodonta*. In 1819 he added the genera *Hyria* and *Iridina*, but placed *Castalia* wrongly in the family Trigoniacea, an error which was rectified by Ferussac in 1822, by Latrielle in 1825, by Blainville in the same year, and by Menke in 1828. In 1820 Rafinesque[4] created the family Pediferia for *Unio*, *Anodonta*, and several related genera, including *Cyclas*.

Blainville in 1825[5] refused to accept the classification of Lamarck, and made a family Submytilacea, with the genera *Anodonta*, *Unio*, and *Cardita*, thus returning to the errors of Poli, who in 1795[6] gave the name *Limnæa* to animals inhabiting the shells belonging to the genera *Unio*, *Anodonta*, and *Cardita*.

The name Unionidæ was created in 1828 by Fleming,[7] and adopted afterwards by Gray,[8] Swainson,[9] and other modern authors.[10]

[1] Philosophie Zoologique, p. 328, 1805.
[2] Extrait du Cours de Zool., p. 106, 1812.
[3] Phil. Zoologique, I, p. 318, 1830.
[4] Ann. Génér. Sciences Physiques, p. 290, 1820.
[5] Man. de Malacol. et Conchyliol., p. 537, 1825.
[6] Testacea Utriusque Siciliæ, II, p. 253, 1795.
[7] Hist. British Animals, p. 408, 1828.
[8] In Turton, A Manual of the Land and Fresh-water Shells, p. 288, 1840.
[9] Treatise on Malacology, p. 259, 1840.
[10] The names of Lamarck, Rafinesque and Blainville can not be considered, since it is a rule in nomenclature that a family or subfamily name must be founded on one of its principal genera. Hence *Unionidæ* must take precedence.

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Swainson in 1840[1] divided the Unionidæ into five subfamilies, from a study of the shell: First, Unioninæ (*Unio*, Lamarck; *Æglia*, Swainson; *Mysca*, Turton); Second, Hyrianæ (*Iridea*, Swainson; *Castalia*, Lamarck; *Hyria*, Lamarck; *Hyridella*, Swainson); Third, Iridininæ (*Iridina*, Lamarck; *Calliscapha*, Swainson; *Mycetopus*, A. d'Orbigny); Fourth, Anodontinæ (subgenera *Anodon*, Lamarck, etc.); Fifth, Alasmodontinæ (*Alasmodon*, Say).

Gray in 1847,[2] following the anatomical papers of A. d'Orbigny and other authors, proposed to form a new family, Mutelidæ, with the genera *Mutela*, *Leila*, *Pleiodon*, and a part of *Paxyodon* of Schumacher. These genera differ from *Unio* by the presence of two distinct siphons, and were separated from the Unionidæ for that reason. Previously Gray, in 1842,[3] had made a family Mycetopodidæ for the genus *Mycetopoda*, d'Orbigny, on account of the foot presenting a remarkable conformation.

The views of Gray have been adopted by many authors, who have admitted among the Naiades of Lamarck two or three families; others an equal number of subfamilies. Thus H. and A. Adams[4] admit two families: Unionidæ (subfamilies Unioninæ and Mycetopinæ) and Mutelidæ. Chenu[5] enumerates three subfamilies: Unioninæ, Mycetopinæ, and Iridinæ; Gill,[6] three families: Unionidæ, Iridinidæ, and Mycetopodidæ; Clessin,[7] two subfamilies, to which he gave the names generally adopted for the families—Unionidæ and Mutelidæ; Tryon,[8] three families: Unionidæ, Iridinidæ, and Mycetopodidæ; and Fischer,[9] two subfamilies: Unioninæ and Mutelinæ.

We see, then, that all the authors agree to make two grand divisions among the Naiades of Lamarck, based upon the fact of the siphons being more or less complete. The other organs of the animals, which to a lesser extent serve for purposes of classification, have been examined by Troschel[10] and characterize the nine genera which are known in the family Unionidæ. The anatomical classification of Agassiz[11] is not applicable to these mollusks in North America. Isaac Lea[12] attempted to classify the Unionidæ by the external characters of the shell, the hinge (dorsal border symphynote or non-symphynote), the sculpture and the form. This classification is, of course, largely artificial,

[1] Treatise on Malacology, p. 377, 1840.
[2] Proc. Zool. Soc. London, p. 197, 1847.
[3] Syn. Brit. Mus., pp. 81, 92, 1842.
[4] The Genera of Recent Mollusks, II, p. 505, 1857.
[5] Manuel Conchyl. et Paléont. Conch., II, pp. 136, 147, 1862.
[6] Arrang. Families of Mollusks, p. 20, 1871.
[7] Malakozool. Blatt, XXII, p. 12, 1875.
[8] Struc. and Syst. Conch., III, p. 237, 1884.
[9] Manuel de Conchyliol., p. 998.
[10] Wiegmann's Archiv, XII, 1847.
[11] In W. Stimpson, The Shells of New England, 1851. See also Archiv für Naturg., 1852, p. 41.
[12] A Synopsis of the Family Unionidæ, pp. xxiv, xxv, 1870, and in earlier editions.

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since it brings together many unrelated species and widely separates others that have strong affinities. In justice to Dr. Lea it should be said that he regarded it as merely a temporary expedient, to be superseded by a more natural method when a better knowledge of the soft parts could be obtained.

H. von Ihering has recently proposed a new classification[1] of the Naiades, taking the form of their larvæ as a distinctive character. While the species of Europe and North America have a larva (Glochidium) furnished with a bivalve shell, which can completely inclose it, a certain number of forms of South America pass through a peculiar stage, named *Lasidium* by v. Ihering, in which the larva is formed of three segments, carrying only a small single shell on the middle part. The same stage is probably passed through by the young of several African genera. In consequence he divides the Naiades into two families—the Mutelidæ (genera *Leila*, Gray; *Fossula*, Lea; *Mycetopus*, A. d'Orbigny; *Glabaris*, Gray; *Aplodon*, Spix; *Plagiodon*, Lea; *Solenaia*, Conrad; *Mutela*, Scopoli; *Iridina*, Lamarck; *Spatha*, Lea) and the Unionidæ (genera *Hyria*, Lamarck; *Castalia*, Lamarck; *Castalina*, v. Ihering; *Unio*, Philipsson; *Margaritana*, Schumacher; *Cristaria*, Schumacher; *Pseudodon*, Gould, and *Anodonta*, Lamarck).

The foregoing sketch of the classification of the Naiades is taken in part from the admirable work of Fischer and Crosse on Mexican and Central American mollusks.[2]

In the present state of our limited, and in some cases total lack of knowledge of the anatomy of several of the genera of Naiades, any classification must be more or less tentative. The division of these mollusks by most authors into two families, Unionidæ and Mutelidæ, or two subfamilies, Unioninæ and Mutelinæ, founded upon the incompleteness or completeness of the development of siphons, can not stand. This has been shown by the researches of Lea and d'Orbigny into the anatomy of *Glabaris* many years ago; for while some species of this genus have the mantle closed posteriorly so as to form siphons, in others, which are evidently closely related, the mantle is free. More recently v. Ihering has shown[3] that a given species of his genus *Castalina* may have an animal which has the two siphons completely developed, thus placing it with the Mutelidæ, or it may be that of a perfect *Unio*, having no siphons at all, thus belonging with the Unionidæ. The same thing is true to some extent in the well-known genus *Castalia*, and it is quite probable that this character will be found to vary in other genera of Naiades.

So far as conchological characters are concerned, *Castalia* (and with it *Castalina*, which has been separated from it) and *Hyria*, though hitherto placed with the Mutelidæ, are evidently members of the

[1] Archiv für Naturgeschichte, p. 52, 1893.

[2] Mission Scientifique au Mexique et dans l'Amerique Centrale, 7th part, II, p. 505, 1894.

[3] Zool. Anzeiger, Nos. 380 and 381, 1891–92, pp. 1–14.

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Unionidæ.[1] The Castalias, Castalinas and Hyrias have the radial beak sculpture which is found on every species of South American *Unio*, but on none of the other Naiades. The hinge teeth consist of cardinals and laterals, the former being more divided than is usual in *Unio*, though there are some species in the latter genus which have the cardinals separated into several parts. The laterals are Unionoid, but are more or less vertically striated in *Castalia* and *Castalina*, and sometimes, to a certain extent, in *Hyria*. This latter character, however, is not generic or even specific. The hinge teeth in the bivalves were undoubtedly developed in order to lock the valves of such species as were subject to shock, and prevent them from being twisted out of place. I believe it will be found that in most, if not all cases where they are needed, the shell never opens so far but what they lock one valve with the other. The mantle is carried as a thin, tough, elastic sheet between the hinge plates and over the teeth in the Naiades, and it will be readily seen that any unusual roughening, such as the development of granules or vertical striation, would render them much less liable to slip than if they were smooth. Hence, in many solid-shelled Unionids, especially in elongated species, the character of vertical teeth striation will be found. It is especially developed in many of the heavy Chinese Unios, and I have noticed it in *Unio parallelopipedon* of South America, in *Unio shepardianus*, *ligamentinus*, *crassus*, *luteolus*, *anodontoides*, and others, of the United States.[2]

Unio kraussi, Lea, of Surinam, of which the type is in the National Museum (No. 84379), seems to stand about midway, conchologically, between *Unio* and *Castalia*, but in a different direction from *Castalina*. It has the strong radial beak sculpture of *Castalia*, especially near the posterior ridge, where it extends more than one-third of the distance from the beaks to the periphery. It is much inflated, and has a form more circular than that of *Castalia*, a brown epidermis and strong concentric sculpture. The teeth stand about midway between those of

[1]Ihering believes that *Hyria* will be found to vary in the character of its mantle openings in the same way that *Castalina* and *Castalia* do. (Zool. Anzeiger, Nos. 380 and 381, 1891-92, p. 5.)

[2]The characters of the teeth of the four genera *Unio*, *Hyria*, *Castalia* and *Castalina*, are very variable. *Unio charruanus*, d'Orbigny, has about 4 strong cardinals and several minor teeth in each valve, besides the ordinary laterals, which, with quite a number of not closely related species from Brazil, show traces of vertical striation. *Unio acutirostris*, Lea, from southern South America, has about 12 denticles in the cardinal area of each valve. In the younger shells there are usually the ordinary compressed cardinals, one in the left valve and two in the right, and as the specimens become adult they split up and assume a very different appearance. *Unio patagonicus*, d'Orbigny, shows this transition finely. In *Unio gibbosus*, Barnes, of the United States, the laterals are quite often somewhat vertically striated, and sometimes have oblique striæ pointing anteriorly or posteriorly. Specimens of *Castalina martensi*, v. Ihering, in the National Museum (No. 125736), plainly show both vertical and oblique striæ on the laterals in the same hinge, the oblique lines being finer and partly laid over the vertical ridges.

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Unio and *Castalia*, the cardinals being somewhat elongated and broken; and these, with the laterals, are more or less corrugated, and show traces of vertical striation. It was named *Castalia sulcata* by Krauss, but was placed in *Unio* by Lea, and as its specific name was preoccupied in the latter genus, he changed it to *kraussi*.

Castalia duprei, Lea, shows characters in the teeth which approach *Hyria*. It is a smooth, light yellowish green shell of thin texture, triangular in outline, and much inflated, with an excessively high, sharp keel running from the beaks to the posterior basal margin. The cardinals are much elongated and sometimes broken, as in *Hyria*. The arch of the hinge plate under the beaks is high and sharp. There is no radiating sculpture, and there appears to be none of any kind on the beaks. I agree with von Ihering that this should quite probably be placed in a new genus.

Hyria, on the other hand, seems to be equally connected with *Unio*. In *U. stevensi*, Lea, from northern South America, the form, sculpture, and external appearance are decidedly like that of *Hyria corrugata*, it being furnished with quite a distinct anterior dorsal wing and a slight hint at one posteriorly. This species of *Hyria* is sometimes destitute of a wing behind, and this part of the shell occasionally ends in a somewhat obtuse angle. The hinge teeth of *Unio stevensi* partake, to some extent, of the characters of both genera, though they are more Unionoid than Hyrioid. The species should probably, however, be placed in *Hyria*.

Unio ortoni, Lea, of which the type—a single left valve, and the only specimen I have seen—is in the Museum collection (No. 25430, U. S. N. M.), approaches the form of *Unio* somewhat, but its sculpture is very much like that of *Hyria*, and its cardinals are multifid. It is very doubtful which genus should receive it, and it quite probably should have a new generic name.

I think there can be little doubt that the relation between these four genera, *Unio*, *Hyria*, *Castalia* and *Castalina*, is a close one anatomically and conchologically, and that they must all be placed in one family in any natural arrangement. Yet in a classification based upon the development or want of development of the siphons, the former has been made the type of one family, the Unionidæ, and the other three have been placed in another, the Mutelidæ. *Glabaris*, which, as I have shown, may have either perfect siphons or an open mantle, has generally been placed in the genus *Anodonta*, in the Unionidæ, though some authors give it a place in the other family. *Mycetopus*, which has an open mantle, has generally been put in the Unionidæ, but it is, as I expect to show farther on, more likely a member of the Mutelidæ.

So far as I am aware, nothing is known of the larval state of any of the African Naiades, so that the character of the embryo, on which von Ihering bases his classification, can not yet be used in determining the relationships of the peculiarly African genera.

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Genus UNIO, Retzius.

It seems to be impossible to ascertain with certainty who is the author of this genus. In 1788 Laurentius Münter Philipsson described it in a thesis delivered under the presidency of his master, Retzius,[1] at the University of Lund, in Sweden, at a public examination for a doctor's degree. Whether Philipsson or Retzius should be credited with the genus can not be positively known, as it is believed by some that the master was the author of the dissertation, which the student merely defended. I am inclined to take this view of the matter, for the reason that Retzius was an author of repute, while it is not known that Philipsson ever gave any attention to natural history or was the author of any genera or species before or since. There was no special designation of any type, but the species were mentioned in the following order: *Unio margaritiferus*, *U. crassus*, *U. tumidus*, *U. pictorum*, *U. ovalis*, *and U. corrugatus.*

We can not consider the genus *Margaritana*, founded on the absence of lateral teeth, a valid one, because the first species which is mentioned in this list is the type of the genus *Unio* (and also of *Margaritana*, founded many years later), and this is placed by itself in a section which is designated as lacking lamellar teeth,[2] while the other five species are put in a second section, characterized by lateral teeth. Therefore, in case of a generic separation, founded on the presence or absence of lamellar teeth, the species wanting them would have to be placed in the genus *Unio*, and another name given to the forms having both sets of teeth. But, as I shall show farther on—I think satisfactorily—that the different species usually placed in *Margaritana* are merely Unios with ordinarily imperfect teeth, we can use Retzius' generic name to include all the forms that are commonly placed in the two genera.

The genus *Unio* is by far the most numerous in species, and is the most widely distributed of any of the Naiades, as well as the most variable in its characters. It is found in the fresh waters of all the continents, especially in the rivers and streams, while the nearly related *Anodonta* is more commonly an inhabitant of lakes and ponds.

In the East Indian Archipelago it is met with in perhaps all the larger islands, extending east into the Solomon group; it is abundant in Australia, New Zealand, Tasmania, the Philippines and Japan. It is found in Ceylon, Madagascar, the British Isles, and in Cuba. The only considerable continental areas in which it is believed not to occur are that part of North America lying south of the fortieth parallel of north latitude, having a drainage into the Pacific; the extreme arctic regions, and a considerable area of the Sahara and Gobi deserts.

[1] Dissertatio historico-naturalis, sistens nova testaceorum genera, p. 16. The following is the original diagnosis: "Unio.—Animal ascidia. Testa bivalvis, æquivalvis, æquilatera.—Cardo. Dens ani in valvula dextra solidus, subintrusus, in sinistra duplex; omnes crenulati. In plurimus dens vulvæ longitudinalis lamellaris intra sinistræ valvulæ bilamellarem.

[2] Dente vulvæ nullo, sed margo horizontalis.

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On account of the great variability of characters of the shell and animal of many of the different species, a number of conchologists, among whom are Rafinesque,[1] Swainson,[2] Agassiz[3] and others, have attempted to divide the genus into other genera and subgenera. These groups are, I believe, unworthy of any scientific standing on account of the absolute blending of conchological characters in many cases and the great variability of the soft parts.

Ihering has stated[4] that the South American Unios, so far as his knowledge goes, develop the embryos in the inner branchiæ and not in the outer. Sutor has examined a number of the New Zealand Unios in order to determine whether they were closely related anatomically to those of South America, and he states[5] that he found nearly all the embryos in the inner branchiæ. Conchologically there is a very close relation between the Unios of New Zealand, Australia, Tasmania and South America, and there can be little doubt that the species throughout have this anatomical peculiarity. In addition to this, the embryos of the anstral species seem to be mostly destitute of hooks, and von Ihering believes that they do not pass a part of their larval stage encysted on the fins and gills of fishes, as do many of those of the northern hemisphere.[6]

On the other hand, the Unios of the northern hemisphere, so far as is known, bear their embryos in the outer gills, and a considerable proportion of them have hooks. Lea found these appendages in a large number of embryos of Unios and Anodontas, but absent in others. In those of *U. luteolus* he found no hooks, but the nearly related *U. radiatus* was furnished with four small ones, while in some specimens of *Anodonta ovata*, Lea, they were present and in others absent.[7]

It is possible that hooks may be in some cases developed on the embryo at one stage of its existence, and become broken off or obsolete at another, as Lea found some examples in which they were imperfectly developed. Some of the species of Europe have been actually observed attached to the gills and fins of fishes by these hooks, and it is quite probable that many of those of North America have similar habits. During this period of attachment, which occupies two months or more, the larvæ become encysted, and the organs develop, though the shell does not increase greatly in size

So far as I know, all the Unios of South America, south of the Isth-

[1] Mon. des Coq. Biv. Fluv. de la Riv. Ohio, 1820. Ann. Gén. des Sci. Phys., Brux., p. 291.

[2] A Treatise on Malacology, 1840, p. 266.

[3] Archiv für Nat., 1852, p. 42.

[4] New Zealand Journal of Science, I, No. 4 (n. s.), p. 152, 1891.

[5] New Zealand Journal of Science, I, No. 6 (n. s.), p. 250, 1891.

[6] Lea found hooks on the embryos of *Unio peculiaris* and *U. firmus*, two well-known South American species. (Obs., XII, pp. 26, 28.) He also states that *Unio multiplicatus*, Lea, *U. rubiginosus*, Lea, *U. kleinianus*, Lea, and *U. subrotundus*, Lea, bear the embryos in all four leaves of the branchiæ.

[7] Obs. on the Genus Unio, VI, p. 49, X, p. 89.

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mus of Panama, have radial beak sculpture, which sometimes extends well over the body of the shell. I know of no others having this character except *Unio rotundatus*, Lamarck, of Texas and Louisiana, which occasionally exhibits this peculiarity in a slight degree, and which, singularly enough, by its form resembles many of those of South America. The Unios of New Zealand and Australia have, so far as I have been able to observe, curved or imperfectly radial beak sculpture, approaching somewhat that of several of the species of South America. Nearly all the austral forms (excepting those of Africa) have peculiarly compressed cardinal teeth, there being a single one in the right and two in the left valve, sometimes slightly multifid, and between those of the latter valve there is a parallel-sided pit, into which the cardinal of the right valve fits.

I believe that these characters of the shell and embryo, which seem to be reasonably constant, will justify the separation of the Unios of South America, Australia, New Zealand and Tasmania into a subgenus, for which may be used the name *Diplodon*, applied by Spix to *Unio ellipticus* and *U. rotundus* of Brazil.[1] There can be but little doubt that these belong to a different and perhaps older phylum than the species of Europe, Asia, Africa and North America.[2]

The writer has proposed for the American species[3] a subdivision into groups, which should contain species evidently allied by conchological, anatomical and embryological characters. Each group he proposed to call after some widely distributed, abundant and characteristic species belonging to it. Thus an assemblage of solid, oval forms with radiating stripes, common in the Mississippi Valley, is fairly typified by the well-known *Unio ligamentinus* of Lamarck; another of large, rather light, inflated forms from the same region, is represented by *U. ventricosus*, Barnes; a third, consisting of compressed, rhomboid species of the Atlantic drainage, by *U. complanatus;* and to speak of these different divisions as the group of *Unio ligamentinus*, *U. occidens*, or *U. complanatus* group, at once conveys to the mind of the merest novice just what is meant.

The arrangement is not at all a new one, having been used more or less by Lea, Lewis, Call, Marsh, and other conchologists. Recently Fischer and Crosse[4] in monographing the Mexican and Central American Anodontas and Unios, group them in the same way, but apply special names to the sections. It seems to me that such names merely tend to cumber the literature, and uselessly add to the labor of the conchologist in committing them to memory.

In arranging the Naiades of the National Museum, I have become convinced that this system of grouping, as I have outlined it, is practi-

[1] Test, Fluv. Bras., p. 33, 1827.

[2] Lea believed that a natural classification would be founded on the development of the embryos in the internal or external branchiae.

[3] Proc. U. S. Nat. Mus., XV, 1892, p. 405, and Amer. Nat., XXVII, No. 316, p. 353.

[4] Miss. Sci. aux Mex. dans l'Am. Cent., 7th part, II, pp. 517, 555, 1894.

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cal, and may be applied to every genus, and that we may thus refer to certain species as belonging to the group of *Unio littoralis*, the group of *Anodonta cygnea*, the group of *Spatha rubens*, and the like.

In 1817 Schumacher[1] subdivided *Unio*, and established the genus *Margaritana* for the *U.* (*Mya*) *margaritiferus* of Linnæus, on account of the fact that it lacked the lateral teeth of the other species. Since that time a number of North American forms have been added to this genus, which has been quite generally accepted as such by modern authors, among whom is Tryon;[2] and as a subgenus by Lea[3] and Fischer.[4]

After a good deal of study of the animal and shell, I am forced to the belief that the different Margaritanas are merely a number of generally not at all closely related species of Unios, in which the lateral teeth—perhaps from various causes to be mentioned hereafter—have become either more or less blurred or depauperated. Some of these, by the characters of the shell and soft parts, evidently group with species of Unios in which the teeth are nearly or quite perfect. In such species as *Margaritana rugosa*, Barnes, *M. confragosa*, Say, *M. complanata*, Barnes, and *M. calceola*, Lea, there are almost always more or less perfectly developed laterals which look as though they were diseased, and have a blurred appearance, the normally single or double lamellæ being divided into several irregularly developed, elongated ridges. Nearly all the species occasionally have as perfect teeth as any Unio. The National Museum possesses a series of young shells of *M. margaritifera* (No. 60878) from the State of Washington, in which most of the specimens have fairly good laterals, and another specimen (No. 86286, U. S. N. M.) in the Lea collection from Massachusetts has cardinals and laterals as perfect as those of any Unio. The same is true of many specimens of this species from Europe and northern Asia. The group which this species typifies is a remarkable one, not only because it shows great variation in the development of the hinge teeth, but for its wide and somewhat peculiar geographical distribution. I place in it the following species, beginning with those which have the laterals least developed and proceeding to forms in which they are perfect:

UNIO MARGARITIFERUS, Linnæus.

All Europe; all northern Asia, including Japan; northwestern North America south to latitude 40° north; Upper Missouri River; Canada and eastern United States south to latitude 40° north, in streams draining into the Atlantic. Cardinals sometimes stump-like and imperfect; laterals generally wanting.

[1] Essai d'un nouveau syst. des habit. des vers testacés, p. 137, 1817.
[2] Structural and Systematic Conchology, p. 240.
[3] Synopsis of the Unionidæ, p. 67 et seq.
[4] Manuel de Conchyliologie, p. 1001.

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UNIO MONODONTUS, Say.

Central part of the Mississippi Valley. The teeth are very variable. Cardinals usually quite imperfect, or even rudimentary, though sometimes well developed. Laterals present or absent, and showing every possible degree of development. On account of this great variation the species has been placed about as often in *Unio* as *Margaritana*.

UNIO DECUMBENS, Lea.

Northern Alabama and possibly adjoining States. Shell somewhat resembling *U. monodontus*, but shorter, wider, and with rather better developed teeth.

UNIO HEMBELI, Conrad.

Louisiana. Very closely resembles *Unio margaritiferus*, but is occasionally slightly plicate on the posterior slope. The hinge is very much like that of the latter species, but in all the specimens I have seen the somewhat feeble laterals are always present.

UNIO LAOSENSIS, Lea.

Southeastern Asia. A somewhat smaller species than *U. margaritiferus*, but closely resembling it. The teeth are generally quite well developed.

UNIO CRASSUS, Retzius.

Southern Europe. A large, very heavy species, often becoming arcuate when old, with very strong, well-developed cardinals and laterals.

Conchologically and anatomically, so far as is known, the above species form a very natural group. All the shells are elongated, rounded before and behind; arcuate when old, without angles or sculpture, except in the case of *U. hembeli;* with uniform, rayless, thick, dark epidermis; a curved hinge line, and a hinge plate which is narrowed and rounded just back of the cardinals.

The fact of the presence or absence of lateral or cardinal teeth in certain of the Naiades can not be taken as a proof of generic distinction. In Java, the Philippines, and perhaps certain other islands of the East Indian Archipelago, there is found a group of Naiades having moderate sized, thin shells, of a peculiar lurid purplish or reddish texture, in which the prismatic layer forms a rather wide border.[1]

These species, all of which have greatly compressed teeth, exhibit the most remarkable variation in the degree of their development. Some of them have perfect cardinals and laterals, others to the naked eye are destitute of either, but with a glass show traces of one or both, and

[1]The group is typified by *Unio bengalensis*, Lea, but it is doubtful whether any of the species are found on the continent. According to Hanley and Theobald (Conch. Indica, p. 62), *U. bengalensis* does not come from India, but from the Philippines.

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these edentulous forms have been generally called Anodontas. But it often happens that in a lot of individuals of a single species taken from one locality, there will be found every variation from perfect teeth to the merest vestiges. For this reason, and on account of the fact that most of the shells of the group have beautiful, delicate, chevron-shaped beak sculpture, which often extends well on to the body of the shell, of a form quite characteristic of many Oriental Unios, I have no doubt, although we know nothing of the soft parts of the members of this group, that they must be placed with *Unio*. Some of the Margaritanas evidently belong with well-known groups of Unios. In the group of *U. margaritiferus*, I have given examples. *Margaritana rugosa*, Barnes, sometimes approaches so closely in external appearance to *Unio pressus*, Lea, that one is labeled with the name of the other by competent students. It has the same compressed, elongate-rhomboid form, and both are rayed alike; the only essential difference in appearance being that the former is usually somewhat corrugated on the posterior slope, while the latter is without sculpture. Immediately under the beak in the right valve in either species, the hinge plate is almost or entirely cut away. Just before this is a single cardinal, usually somewhat compressed, and on the posterior part of the hinge plate is a more or less perfectly developed lateral. It is usually considerably blurred, even in the *Unio*.

In the left valve there is a triangular, compressed tooth directly opposite the missing portion of the hinge plate in the left valve, which is generally curved backward, and fits into the gap almost perfectly. Just before this is a slightly developed, compressed cardinal, and behind it in the *Unio* two not very perfect, elongated laterals. In the *Margaritana* the laterals of the left valve are generally blurred; sometimes in old shells they are shown as a sort of rounded ridge, but frequently they run more or less diagonally across the hinge plate and point downward posteriorly, as they do in other species of the genus.

In a specimen of *Unio pressus* before me, from White River, Indiana, the same direction is taken by the laterals of the left valve; the lower one running out and ending at the ventral edge of the plate, attaining only a little more than half the length of the other. In rare instances the laterals of the *Margaritana* are nearly perfect, and those of the *Unio* quite blurred. The sculpture of the beaks in both species is much alike, that of the *Unio* being finer. In both, it has a tendency to fall in two loops from points on either side of the beaks. The soft parts of these species are singularly alike.

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COMPARISON OF DESCRIPTIONS OF UNIO PRESSUS AND MARGARITANA RUGOSA.

Unio pressus, LEA.	*Margaritana rugosa*, BARNES.
Branchiæ large, rounded below, free nearly the whole length of the abdominal sac.	Branchiæ very large, rounded below, the inner ones much the larger, free the whole length of the abdominal sac.
Palpi small, subangular, united halfway down the posterior edges.	Palpi rather small, subangular, united nearly halfway down the posterior edges.
Mantle thin, slightly thickened on the margins.	Mantle rather thin, much thicker on the margins, blackish on posterior, basal edge.
Branchial opening large, blackish on the edge, and with numerous papillæ.	Branchial opening rather large, with small brown papillæ.
Anal opening rather small, blackish, and without papillæ.	Anal opening rather large, without papillæ.
Superanal opening rather large, united for some distance below, blackish on the edges.	Superanal opening very large, with a dark brown line within, united below.
Color of the mass, dirty white.	Color of the mass, salmon.
Embryonic shell subtriangular, light brown; with hooks.	Embryonic shell triangular, brown; with hooks.

In *Margaritana complanata*, Barnes, which has a beak sculpture quite like that of *Unio pressus*, but coarser, a similar arrangement of teeth is seen, though the shell is heavier, more rounded, and the hinge plate is broader. In many specimens the hinge of the right valve is completely cut away at the beaks, and the cavity is filled by a corresponding tooth in the left valve. *Unio charlottensis*, Lea, from North Carolina, an undoubted member of this group, has a form approaching that of *Margaritana complanata*, but it is rather more elongated.

Margaritana holstonia sometimes exhibits laterals, and in general form, size and texture so closely resembles some of the species of the group of *Unio nashvillensis*, that even Dr. Lea occasionally labeled them wrongly. *M. confragosa*, Say, resembles no other *Margaritana* at all, but approaches more nearly in form to the Unios of the *Lachrymosus* group, and the animal is remarkably close to those of that assemblage. *Unio biesianus*, Heude, of China, has the same kind of blurred laterals as the American Margaritanas, but it appears from conchological characters to be a member of the group of Unios typified by *U. sinensis*, Lea. I have dwelt at length on this part of the subject because the partial or total want of lateral teeth in the species of *Margaritana* is a very curious feature. I can only believe that they are all true Unios whose teeth have been modified or injured by conditions of water, food, bottom, or some other element of environment. In some of them, where the laterals have merely become obsolete, such as those of the *Margaritifera* group, I think the explanation is easy. *M. monodonta* and *hildrethiana* are found in running water under stones, buried slightly in the mud, and *U. hembeli* lives in the nearly stagnant bayous of Louisiana, so that a strong, toothed hinge is not required to hold the valves in place. The heavy-shelled species that live in running water have blurred laterals which appear as if diseased, and it seems not improbable that they may

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have been subjected to injurious influences in the matter of food, deleterious water, or the like, until these characters have become more or less fixed. In every group of Unios to which these Margaritanas seem to belong, there are species in which the lateral teeth are more or less imperfect, which seems to show that they have been somewhat susceptible to these injurious influences.

In view of the facts I have presented, and many others that might be brought forward, I am forced to the conclusion that the so-called genus *Margaritana* consists of a number of species of Unios with depauperate cardinal or lateral teeth, or both, and that they will have to be placed in the genus *Unio*.

In southeastern Asia and some of the islands of the East Indian Archipelago there is a peculiar group of Naiades with greatly compressed, somewhat elongated shells, having slightly concentric sculpture, the species of which are almost or quite destitute of teeth, and have wonderfully brilliant, silvery, soft-tinted nacre. This group consists of probably but two or three species, though they have received a large number of names, and is fairly typified by a form which Deshayes and Julien called *Anodonta sempervivens*. Nearly all the specimens of the different species show, when examined with a glass, long, delicate, rudimentary laterals, and often vestiges of cardinals in the shape of a smooth, compressed elevation. One of these Lea named *Monocondylæa compressa*. They do not in any way approach any *Anodonta* I know of, though most of the so-called species have been placed in that genus. Deshayes and Julien[1] state that the animal is pure, milky white, but that they "cannot give a detailed description of it, though it resembles in its characters generally that of the species (of *Anodonta*) common in streams and ponds." They appear to be most nearly related to *Unio semialatus*, Deshayes, and others of the *Marginalis* group.

Rochebrune in 1882[2] gave the generic name *Harmandia* to *Unio somboriensis*, Rochebrune. It is merely a peculiar *Unio*, having the surface covered with somewhat radiating, sometimes slightly zigzag ribs, those of the posterior running nearly horizontal, the remainder more or less radiant from the umbonal region. Near the center of the disk, two or three of these irregular ribs before, and as many behind, curve toward each other and join, somewhat after the manner of several South American species. Sculpture approaching this, but not so strongly developed, is often found in *U. cæruleus* and other Indian Unios. The laterals are double in each valve, and a small, thin lamella curves upward from the upper lateral near its posterior end. A vestige of this third, upper, curving tooth is found in *U. fluctiger*, Lea, said to come from Guiana, but undoubtedly an East Indian species, and the same character is found in *U. crispatus* of Gould.

[1] Mollusques Nouveaux du Cambodge. Nouv. Arch. du Muséum, Bull. IX, pp. 122, 123.

[2] Bull. Soc. Philom. (7), VI, pp. 45, 46, pl. 1, 1882.

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Grandidieria, Bourguignat, erected by that author into a genus, and placed by him in the family Corbiculidæ,[1] is merely a section of small, rather solid, inflated Central African Unios, often having compressed, reflected, dentate cardinal teeth, much like those of *Unio parvus* and its allies of the United States. In 1888 Bourguignat claimed to know twenty-five species of this genus in Lake Tanganyika, and believed that if its waters were to be fully explored the number would be increased to one hundred. No further comment is needed on the work of the great master of the new school of French conchologists.

Pharaonia, Bourguignat,[2] is another of this author's African genera, which includes a few thin-shelled Unios, with compressed, elongated cardinals and laterals.

Reneus, Jousseaume,[3] is still another so-called genus, consisting of a few small, thin-shelled, concentrically-striated tropical African Unios.

Microdontia, Tapperone Canefri,[4] was established for *Unio anodontiformis*, Tapperone Canefri, from the Fly River, New Guinea, and is probably only a section of *Unio*. The very brief Latin description is wholly inadequate for its proper determination.

The characters of the shell and soft parts of the genus *Unio* may be summed up as follows:

Shell variable in form, usually equivalve and inequilateral, rounded, elongated, angular or symphynote; with tubercular, zigzag, or concentric sculpture; beaks variously sculptured or smooth, and occasionally showing vestiges of a glochidium; epidermis thick, hinge line incurved in front of the beaks; hinge having normally one cardinal and one lateral tooth in the right valve, and two cardinals and two laterals in the left, or they may be almost wholly lacking or greatly varied in arrangement; pallial line entire; interior nacreous. Animal dioecious; mantle open; branchial opening oblong, fringed with numerous papillæ; anal opening with or without papillæ, usually separated from the superanal opening; labial palpi generally wider than long, with free points, more or less united posteriorly; branchiæ large, the embryos being borne in the outer or inner pair, or rarely in all four of them.

Genus BURTONIA, Bourguignat.[5]

I am inclined to believe that the species of this genus, of whose anatomy nothing whatever is known, are merely peculiar, compressed, somewhat symphynote Unios. In such species as I have been able to examine, there are vestiges of cardinal and lateral teeth; the anterior cicatrices are united, and the nacre is of a peculiarly rich, usually reddish tint.

[1] Bull. Soc. Malac. France, II, pp. 1–12, 1885.
[2] Bull. Soc. Zool. France, XI, pp. 471–502, pl. XII–XIV, 1894.
[3] Bull. Soc. Zool. France, XI, pp. 481, 482, pl. XII, fig. 4, 1894.
[4] Ann. Mus. Genova, XIV, p. 229, pl. XI, figs. 3–5, 1883.
[5] Moll. Fluv. Nyanza, pp. 20–23, 1883.

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From the region of the beaks in the interior, there springs a series of slight, radiating, irregular ridges, and between the outer ends of these are three curious dorsal cicatrices. These are like the posterior cicatrices of an ordinary *Unio*, being rounded or semicircular, and not impressed. The posterior muscle scars are very indistinct.

The beaks are sculptured with somewhat scattered nodules, which are seen very plainly in *B. tanganyicensis*, Smith, but not so clearly in *B. elongata*, Bourguignat. Two specimens of the latter in the National Museum collection (No. 127190), seem to show the remains of a glochidium quite distinctly; and this character, the beak sculpture, and the rudimentary cardinal and lateral teeth, induce me to place the group in the Unionidæ instead of the Mutelidæ, to which it has been assigned. The shells frequently have the posterior end turned to the left or right like those of *Tellina*.

Genus ANODONTA, (Bruguière *em.*) Lamarck.[1]

In 1792 Bruguiere[2] applied the name *Anodontites* to certain edentulous mollusks, properly describing the genus, mentioning *Mytilus cygneus* and *M. anatinus* of Linnæus, as belonging to it, and describing a new species, *A. crispata* of Guiana, which is now believed to have no generic relation to either of the other species. In 1797 he figured, without text, a large number of species.[3] This generic name was adopted by Cuvier, Poiret, Deshayes and others.

In 1799 Lamarck changed the name to *Anodonta*,[4] describing the genus, and citing *A. cygnea*, Linnæus, as the type. In 1805 Roissy[5] explained that the genus was due to Bruguière, but that Lamarck changed the termination, because in the nomenclature as then regulated, the termination *ites* indicated that the genus included only extinct species. Dr. Dall has worked out the above puzzling synonymy with a great deal of care, and believes that under the rules of nomenclature as they then existed Lamarck was justified in making the change in termination—that *Anodonta* is synonymous with *Anodontites*, and that the former should be retained.

The *Anodontites crispata* of Bruguière, from northern South America, is fairly typical of a large group of the genus *Glabaris* of Gray, which is now placed by v. Ihering and others in the family Mutelidæ.

The genus *Anodonta*, as now restricted, consists of Naiades with generally thin, inflated shells, for the most part without sharp angles, and free from sculpture except on the region of the beaks. The hinge line is a regular curve and is not indented in front of the beaks as is that of *Unio*, and this seems to be about the best distinguishing character

[1] Prodrome Class. Coq., p. 87, 1799.
[2] Journ. Hist. Nat., I, p. 131, 1792.
[3] Encycl. Meth., pls. 201-205, 1797.
[4] Prodrome Class. Coq., p. 87, 1799.
[5] Hist. Nat. Moll., VI, p. 312, 1805.

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between the two genera. The hinge is either destitute of teeth or exhibits them only in a rudimentary condition, and the nacre is less brilliant, as a rule, than it is in the Unios. *Anodonta implicata*, Say, and *A. fenoulli*, Heude, are greatly thickened usually in the anterior region, often becoming as solid as some of the heavier Unios. *A. angulata*, Lea, is also quite a solid shell, and is generally strongly inflated and sharply angled on the posterior slope. According to Hemphill,[1] it was found in hard, clayey gravel, in the Snake River, burrowing so that only the solid, angled posterior end came to a level with the surface. This is no doubt a modification of the shell in order to enable it to resist the shock of the currents, as specimens of the same species taken from still waters are thinner, more compressed, and almost entirely destitute of the posterior angle. This species has usually rudimentary teeth, and in the young both cardinals and laterals are often perfect. The shell is incurved in front of the beaks and it may be a true *Unio*.

The animal of *Anodonta* is essentially the same as that of *Unio*, and there can be but little doubt that the two genera are very closely related. Whether *Anodonta* or *Unio* is the older it is impossible in the present state of our knowledge to tell, as it is quite probable that some of the more ancient forms referred to the former genus are not Anodontas at all. There can be, I think, little doubt that the thick shells and hinge teeth of the Unios were developed in order to enable them to live in currents, as they are generally inhabitants of streams; while the thin, edentulous shell of *Anodonta* is caused by its living in still water; the genus belonging, for the most part, to ponds, lakes, and canals.

The distribution of the true Anodontas is confined to the northern hemisphere—for the most part north of the Tropic of Cancer, the so-called species of South America being *Glabaris*, and those of tropical Africa belonging to *Spatha* and *Mutela*, all genera of the family Mutelidæ. The Anodontas are found throughout North America as far south as southern Mexico; in northeastern Asia; in Japan and China, and in the great region north and west of the Himalayas; also throughout all Europe and northern Africa to the Desert of Sahara, excepting in the Nile, which is peopled with Spathas and Mutelas. The embryo is a glochidium, and probably attaches itself to fishes as does that of *Unio*. It is very difficult to draw the line between the genera *Unio* and *Anodonta*. In the United States there occurs a small group of species, some of which have been placed with *Margaritana*, such as *M. elliotti*, Lea, *M. tombigbeensis*, Lea, and *M. elliptica*, Lea; and others with *Anodonta*, such as *A. edentula*, Say. These species are, with some others, closely related by characters of the shell and soft parts, and all undoubtedly belong to a single group of one genus. In many cases in this group, even in *A. edentula*, there are fairly developed cardinals and even rudimentary laterals, and this, with the general character of the shells, leads me to place the species in *Unio*. *Anodonta ferussaciana*, Lea, and

[1] Zoe, I, No. 11, p. 326.

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a few forms grouping with it, appear to be nearly allied and to stand on the borderland between the two genera. In these species the hinge line is generally incurved at or near the beaks, and quite a distinct vestige of a cardinal is often found, and occasionally rudimentary laterals.

LEPIDODESMA, new genus.

In China there are found a couple of species of remarkable freshwater bivalves of large size, thin structure, and greatly inflated form, with slightly nacreous interiors and triangular outlines. These mollusks were placed by Heude in the genus *Unio*, and by him were named *U. languilati* and *U. aligerus*, the latter of which he makes a variety of the former, but which seems to me quite distinct. The shell has a strong, elevated, sharp ridge running from the beaks to the posterior ventral portion, and another more faintly developed behind this, which ends on the edge of the dorsal slope, thus making it strongly biangulate behind. The young shell, until it is half grown, is sculptured into exceedingly strong, concentric ridges, which follow the growth lines, and which, in the later growth, become more crowded and less elevated, and are covered with a thick lamellar epidermis.

The ligament is enormous; wide, elevated, and rather short, dark brown and shining, and composed of concentric scales, which lap over each other in a posterior direction, the whole looking like the back of a short, stout myriapod. The hinge line in a general way makes a rounded sweep, conforming to the high arch of the beaks, but directly under them it is incurved.

In the left valve are two elevations which probably stand for cardinals, the anterior being elongated, running inwardly in a diagonal manner across the narrow hinge plate, and ending abruptly at the anterior muscle scar. Behind this is a vestige of another, much shorter and fainter, but running parallel with the first, this being on the incurved part of the hinge plate, and just forward of the beaks.

Beneath the ligament are two strong lamellar laterals, the inner much the higher, and with its upper portion strongly curved outward. Just beneath the posterior part of the ligament this tooth is suddenly truncated, but the base extends some distance farther on. Rising from the dorsal slope of this large tooth, and growing partly out of it, is a smaller, lamellar tooth, truncated abruptly behind, and having its upper edge curved outward.

In the right valve there is a single large lateral, truncated behind, curving out at its upper edge, and fitting between the two laterals of the left valve. Anteriorly its hinge plate slopes inward, and bears at its inner edge a low, somewhat elongated cardinal, running nearly parallel with the outer edge of the shell. From the beaks to a considerable distance in front of them is a kind of scaly, folded growth, of modified epidermis perhaps, which extends from the outside of the shell halfway across the hinge plate, which, in life, no doubt, keeps the dorsal

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part of the valves a little way apart, and this probably prevents the teeth from coming in contact. A single dorsal scar can be made out on the inner part of each hinge plate in front of the beaks; the posterior muscle scars are united, as are the anterior ones, and the palleal line is distinct. Nothing is known of the soft parts of this mollusk, but it probably belongs to the Unionidæ, as the teeth, nacre, and muscle scars agree with those of that family. *Unio languilati*, Heude, may be considered the type of the genus.

Genus CRISTARIA, Schumacher.

In 1814 Leach[1] bestowed the generic name *Dipsas* on *Anodonta plicata* (Humphrey), Solander. This name had been used by Laur in 1768, and for that reason could not stand. *Barbula*, frequently applied to this and allied species, is an anonymous catalogue name, attributed to Humphrey. *Cristaria*, bestowed by Schumacher in 1817,[2] will have to be applied to the group. It consists of a few species of large, thin, usually more or less symphynote Naiades, inhabiting Chinese and Japanese waters. Usually there is, especially in younger shells, a fair development of lateral teeth, which, however, are often entirely wanting in old specimens, and occasionally there are rudimentary lamellar cardinals. Some of the species have a row of peculiar, small corrugations or plications running from the beaks to the outer edge of the dorsal slope.

I know nothing of the anatomy of this genus,[3] but from a careful comparison of the shells of several of the species with those of various Chinese Unios, I think it probable that they are depauperate forms, which have descended from the group typified by *U. cumingi*, Lea. This species often shows plainly a row of plications on the dorsal slope, as do *C. plicatus* and *C. spatiosa*. In the Unios of the *Cumingi* group the cardinals are often more or less blurred, or nearly wanting in such species as *U. delaporti*, Crosse and Fischer, *U. myersianus*, Lea, and *U. delphinus*, Lea. Their teeth are sometimes broken up into small denticles or nodules, after the manner of those of certain Hyrias. The suppression of the teeth in the Cristarias is probably caused by the fact that they are inhabitants of muddy places and still water, and they do not therefore need teeth, as do the Unios which inhabit streams. Many of these are abundant in the rice fields of China and Japan. As the group seems to be a tolerably natural one, it perhaps may stand as a genus. *Unio swinhoi*, Adams, of which a shell in the National Museum collection (No. 85069) is said to have come from Formosa, is a thin, somewhat inflated shell, with greatly compressed, feeble cardinals and laterals, and the specimen examined seems very near to *Cristaria discoidea*, Lea,

[1] Zool. Miscell., I, p. 119, 1814.

[2] Essai d'un nouv. syst., p. 107, 1817.

[3] The anatomy of the species *Cristaria plicata* has been worked up, I believe, under the title of *Dipsas plicata*, Lea, by Ishkewara in his "Introduction to the Anatomy of Animals," published in Japanese at Tokio. The paper is not accessible to me.

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which, when young, has usually well-developed cardinals. I believe both should be placed in the genus *Unio*. *Craspedodonta* (Kuster, MS.) differs from *Anodonta* by a peculiar thin lamella at the hinge of the left valve, and is founded on *Anodonta smaragdina*, Anton.[1]

The locality given is uncertain, but Clessin thinks it may be America. The figure represents what is probably an immature shell, of a species unknown to me, and is, I think, a young *Cristaria* with a rather high dorsal ridge, which may be *C. herculea*, Middendorf.

Genus ARCONAIA, Conrad.[2]

In the rivers of China and southeastern Asia certain peculiarities of environment seem to exist, which, in some cases, wonderfully modify the teeth of bivalves, and in others produce curious distortion. Mention has been made in this paper of the remarkable vertical striation of the teeth of some of the Chinese Unios, a character which is not confined to this region, and may be a mechanical development to strengthen the shell. A large number of these Unios are strangely distorted, of which an account will be given later under the heading "Oriental Region," in the discussion of geographical distribution.

In the Arconaias the twisting is both axial and lateral, and I have no means of knowing whether or not this contortion is always in the one direction. However, in certain species of Unios in the groups typified by *U. pisciculus*, Heude, and *U. triformis*, Heude, the shells may be turned sharply at the posterior end either to the right or the left. It is doubtful whether *Arconaia* is generically distinct from *Unio*, but as the anterior part of the shell is always developed into a little wing, and the cardinals differ somewhat from those of any *Unio* I know of, it is perhaps best to let it stand as a genus. According to Deshayes,[3] *A. contorta* has the mantle lobes separable as in *Unio*.

Genus PSEUDODON, Gould.[4]

The species which are now generally included under this generic name were placed by Lea and other authors in *Monocondylæa*—an unrelated South American genus—on account of the similarity of the hinge characters. In most of them a single rounded cardinal tooth or tubercle is found in each valve, and there are no laterals present. *Leguminaia*, Conrad, consisting of a few species of compressed Naiades from southern Europe and western Asia, with vestiges of cardinals, which genus was included by Dr. Lea in *Monocondylæa*, is now generally regarded as a valid genus, so that all the species I should place in *Pseudodon* are confined to southern and eastern Asia, and a few of the islands of the Malay Archipelago.

The group, even when separated from *Monocondylæa* and *Leguminaia*,

[1] Clessin, in Mart. Chem. Conch. Cab. (Anodonta), p. 93, 1876.
[2] Amer. Journ. Conchology, I, p. 234, 1865.
[3] Journ. de Conch., XXII, p. 85.
[4] Proc. Bost. Soc. Nat. Hist., p. 161, 1844.

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is not a natural one, and is made up of what are probably depauperate Unios of different groups. Deshayes and Julien[1] state that the animal of *Monocondylæa* (*Pseudodon*) *tumida*, Morelet, is identical in character with that of *Unio* and *Anodonta*. This is corroborated by Fischer,[2] who probably based his statement on that made by Deshayes and Julien.

There seems to be a peculiar tendency on the part of many of the Naiades of southern and southeastern Asia to develop aborted or imperfect teeth. This is shown in *Cristaria;* in the groups of Unios typified by *U. bengalensis* and *U. sempervivens*, and in *Unio biasianus*, in which, as has been heretofore mentioned, the laterals are blurred, much as in some of the North American Margaritanas. Many of these Pseudodons seem by the form of the shell and its general appearance to be closely allied to certain groups of Unios; thus *P. planulata*, Lea, which has defective laterals and cardinals, is very near in form, texture and nacre to *Unio marginalis*, Lamarck. However, since so little is known of the anatomy of these Oriental forms, it is perhaps best for the present to let the genus stand.

Genus LEGUMINAIA, Conrad.[3]

In 1865 Conrad applied the above generic name to the *Monocondylæa mardinensis* of Lea. In the following year Vest[4] gave the name *Microcondylæa* to *Alasmodonta bonelli* of Ferussac. From a study of the shells I believe the two species, together with a few others in southwestern Asia that seem to be nearly related, should be placed in one genus, and in that case the name *Microcondylæa*, which has generally been applied to Ferussac's species, must be placed in the synonymy. The shells, for the most part, are elongated and compressed, smooth, with slightly corrugated beaks, and have somewhat the appearance of Spathas. The hinge is without laterals, and in place of the cardinals there is in each valve a single, low, compressed tubercle or hook. According to Drouet,[5] the branchial lamellæ of *L. bonelli* are joined on the back; the internal are not adherent to the abdominal sac; the external are united to the mantle throughout their whole length; and Clessin states[6] that the mantle is open the whole length, and in this respect the animal is like that of *Unio*. Nothing definite is known of the soft parts of the Asiatic forms. *Pseudanodonta*, Bourguignat, is no doubt a synonym.

Genus TETRAPLODON, Spix.[7]

The above name was applied by Spix to *Unio pectinatus*, Wagner, which is believed by Lea to be the equivalent of *Castalia truncatus* of authors. The name *Castalia* commonly applied to this genus can

[1] Nouv. Arch. Mus. d'Hist. Nat. Paris, X (1874), p. 118.
[2] Man. de Conchyl., p. 1001.
[3] Amer. Journ. Conch., I, p. 233, 1865.
[4] Verh. u. Mitth. d. Sieben. Ver. f. Natur., 1866, p. 201.
[5] Bull. Soc. Philomathique, 7th Serie, VII, p. 1.
[6] Mal. Blätt., XXII, p. 129.
[7] Testacea Fluviatilia Braziliana, 1827, p. 32, pl. XXV, figs. 3, 4.

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not stand, as it was preoccupied in Vermes by Savigny in 1817. The name *Prisodon* of Schumacher, which is sometimes given to this genus, will have to be used, I think, for the symphynote forms belonging to the group commonly called *Hyria*. The systematic position and relationships of this group have been discussed in this paper under the head of general classification, and the genus undoubtedly should be placed with the Unionidæ. According to Orbigny,[1] the animals examined by him had the mantle free the whole length, except in the anal region, where it was developed into two short distinct tubes, of which the branchial was the larger and furnished with cirri. The branchiæ were large and slightly unequal, and the rounded palpi were very large.

The Adams Brothers state that the outer gill is united to the mantle as far as its extremity, which does not agree with the observations of v. Ihering. According to this observer, *Tetraplodon quadrilatera* has a rounded triangular glochidium without hooks, the embryos being developed in the inner gills.

Genus CASTALINA, v. Ihering.[2]

This genus, of which certain characters have already been discussed, was founded by its author for a few species of South American Naiades which have a somewhat triangular outline and appear to stand about midway between *Unio* and *Tetraplodon*. The fact, as v. Ihering declares, that shells of certain species of the group may contain animals with an open mantle which are perfect Unios, and that others have soft parts with closed siphons, and are therefore *Tetraplodons*, shows that there is a very close relation between *Unio* and *Tetraplodon*, and that this is a transition group, which, from the characters of the animal alone, would not be worthy of generic rank; but the shells are sufficiently distinct from both the above genera to be separated without great difficulty.

Their cardinals are much like those of *Unio*, only more numerous, and the laterals often have traces of vertical or oblique striation, while the posterior ridge is less strong than it is in *Castalia*, and the shells are more compressed.

Genus PRISODON, Schumacher.[3]

The genus *Prisodon* included under Section A, *P. obliquus*, Schumacher, which is a species that has since been placed in Lamarck's genus *Hyria;* and under Section B, *P. truncatus*, Schumacher, a member of another genus, which is now more commonly put in Lamarck's *Castalia*. The excellent figures and descriptions of these species leave no doubt that the above conclusion is correct, while the generic description fairly covers the first species, and it seems to me, notwithstanding

[1] Voy. Am. Mér., p. 597.

[2] Zool. Anzeiger, 1891, p. 478.

[3] Essai Nouv. Système des Habit. vers Testacés, 1817, p. 138, pl. xi, fig. 2.

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the fact that authors generally have based this genus on *P. truncatus*, it must be established on *P. obliquus*, the first-described species.[1]

The corrugated species of this genus have somewhat radiately sculptured beaks, while the smooth forms seem to be destitute of beak sculpture.

Genus SOLENAIA, Conrad.[2]

In southeastern Asia and possibly Australia there is a group of remarkable fresh-water bivalves, having a greatly elongated shell and foot, and bearing some resemblance to *Mycetopus* of South America. Lea placed these forms with this genus,[3] but in 1869 Conrad called attention to the fact that the shells had a long rudimentary lateral, and gave them a generic name, as above. Fischer, in a carefully written paper,[4] places the oriental forms in *Mycetopus*. The foot of the latter genus is enormously developed, cylindrical, and enlarged at its extremity like a mushroom. This remarkable configuration of the shell and foot are to enable the animal to burrow in the sand or mud, where it lives in a vertical position. Fischer communicated with Heude in China, who had described a large number of species, and at his request the latter gathered all the information possible concerning the species of that country. They, too, have a greatly elongated foot, enlarged into a button at its extremity, and burrow in the mud in shallow water. Fischer was no doubt deceived by the fact that similar environment had produced similar modifications in two unrelated groups. *Unio dehiscens*, Say, of the United States, has an elongated shell and a greatly lengthened club-shaped foot, and it also burrows; and I have mentioned the case of *Anodonta angulata*, Lea, which buries itself in the bottoms of rivers and closely resembles one of Heude's species. *Unio anodontoides*, Lea, a well-known form of the Mississippi Valley, was found by Mr. John B. Henderson, jr., in burrows from nine to twelve inches deep, in soft mud in the Maramec River, Missouri, with the foot greatly distended. Yet none of these are *Mycetopus*, or at all closely related to it.

The South American species differ considerably in form from those of Asia, being generally more rounded posteriorly, their shells smooth and of a delicate texture, and having interiorly a wonderfully soft, pearly nacre, while the oriental forms are rather rough, often concentrically sculptured, and covered with a heavy epidermis; the nacre,

[1] Lea applied Schumacher's name *Prisodon* to the *P. truncatus* of that author (Synopsis of the Unionidæ, p. 27, 1870), stating that this name (*Prisodon*) could not be used for his first species (*P. obliquus*) because Klein, in 1753, had given the name *Triquetra* to these symphynote Naiades. As Klein was not a binomial author, *Triquetra* can not stand, and the generic name *Prisodon* will have to be given to *P. obliquus* and the species of that group. Schumacher's *Paxyodon*, described on page 139 of the Essai, is also a *Prisodon*.

[2] Amer. Journ. Conch., IV, pt. 4, p. 249, 1869.

[3] Synopsis of the Unionidæ, p. 90.

[4] Journ. de Conch., XXXVIII, p. 93, 1890. (Observations on the genera *Mycetopus* and *Solenaia*. Second note.)

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though slightly pearly, is dull, and their beaks are plicately sculptured so far as I have been able to observe, while those of *Mycetopus* are smooth. All of these Old World forms have a vestige of a lateral usually in each valve, while the South American species are either absolutely edentulous or present slight traces of taxodont teeth. These are sometimes so faint and so concealed under the external layers of nacre that they can only be seen with a strong glass and a good light, but I have observed them in several specimens. Besides this the two groups are separated by half the diameter of the globe, and I know of none found fossil at any intermediate points.

There is a shell described by Higgins as *Mycetopus falcatus*,[1] which he states came from the Upper Amazon, but which I am inclined to believe is oriental. It has the dull color of the recognized species of *Solenaia*, and the anterior basal portion of the shell is drawn down into a curious projecting lobe. *M. falcatus* might be almost taken for a diminnutive form of *Solenaia soleniformis*, Lea, from Southeastern Asia.

Some of the species of *Solenaia* closely resemble *Anodonta angulata* of California, and it would not surprise me if the young of the former might sometimes be found with rudimentary cardinal teeth, or that this so-called *Anodonta*, which seems to be an aberrant form with a strongly developed foot, should prove to be a *Solenaia*.

Sowerby credits to Australia one species of the genus under consideration. This is the *Mycetopus rugatus* of Sowerby, described in the Conchologia Iconica.[2] It is irregularly, concentrically wrinkled, and the anterior basal portion is somewhat produced, like that of Lea's *M. emarginatus*, while the posterior part is wide and obliquely truncated, after the manner of Lea's species, to which it is no doubt closely related.

If these two genera are separated, *Solenaia*, which is oriental, being placed in the Unionidæ, and *Mycetopus*, a strictly occidental group, in the Mutelidæ, as I believe they must be, they do not support the theory of a connecting antarctic continent, or render it necessary to account for their distribution. Ihering has separated the genera as I do, but places them both in the Mutelidæ.[3]

The following genera have been referred to the Unionidæ, but their rank and position are extremely doubtful, or they belong elsewhere.

Australiella, Tennison Woods,[4] has concentrically sculptured valves, but is not nacreous and therefore not a Naiad.

Jolya, Bourguignat,[5] has been placed near *Mutela* by its author, but is probably a marine or brackish water form.

Byssanodonta, d'Orbigny,[6] of the Parana River, has been often put in the Unionidæ near *Anodonta*, but it belongs in the Mytilidæ.

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[1] Proc. Zool. Soc., London, 1869, p. 179.
[2] Volume XVI, *Mycetopus*, No. 7, 1868.
[3] Archiv für Naturg., 1893, p. 52.
[4] Trans. Roy. Soc. Vict., XVII, 1881, 1882, p. 82.
[5] Lettres Malacologiques, pp. 42–44, 1877.
[6] Voy. Am. Mér., p. 621, 1846.

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Gabillotia, Servain,[1] is typified by *G. pseudopsis*, Locard, of Lake Antioch, Syria. I do not know its position.

Zairia, Rochebrune,[2] proposed for *Z. discrepans*, Rochebrune, etc., from the Congo.

Coltotopterum, Bourguignat,[3] proposed for *C. præclarum*, Bourguignat, is probably a form of *Anodonta cygnea*. The publications containing the last three genera are not accessible to me.

From the foregoing descriptions of genera, I am able to deduce a diagnosis of the family Unionidæ, which I think will contain all the valid genera heretofore described, and which will have to be, in our present state of knowledge of the anatomy, founded largely on shell characters. These, I think, when understood, are sufficiently distinct and constant for use in separating the two families Unionidæ and Mutelidæ. The force of this statement is added to when it is considered that the arrangement I propose, which is founded so largely on shell characters, fully agrees with what we know of the facts of geographical distribution, of the paleontology of the Naiades, and the classification of v. Ihering, based on the characters of the embryos.

Family UNIONIDÆ.

Shell usually equivalve and inequilateral, smooth or variously sculptured, angular or rounded, symphynote or non-symphynote, covered with a thick epidermis, which may be green, brown, yellowish, black, rayed, or variously painted; *beaks usually sculptured* with concentric ridges, corrugations, chevron-shaped or radial patterns, or pustules, *often showing remains of the nuclear shell;* ligament opisthodetic, well-developed, external except when the shell is symphynote. Interior nacreous; with or without hinge teeth, *but showing vestiges of them in every genus;* when present *always schizodont and arranged as cardinals, laterals* (pseudocardinals and pseudolaterals), *or both;* adductor scars generally distinct, the anterior commonly impressed; pallial line simple and generally well marked; *prismatic border usually narrow and not conspicuous.*

Animal: *Labial palpi almost always wider than long, having the upper parts of the posterior margins united; anal opening usually separated from the superanal.* Mantle either free or closed posteriorly to form a branchial opening. *Embryo a glochidium*, the soft parts being inclosed in a pouch-shaped bivalve shell, either with or without hooks, and borne in the inner or outer, or in all four leaves of the branchiæ, which are modified to form a marsupium.[4]

[1] Bull. Soc. Mal. France, VII, p. 296, 1890.

[2] Bull. Soc. Mal. France, III, pp. 1–14, pl. 1, 1886.

[3] Bourguignat, Lettres Malacologiques, pp. 45–48, 1882.

[4] In the above description I have italicized the most important characters, and those which contrast most strongly with the same in the Mutelidæ.

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The following is a list of genera which I place in this family:

Unio, Retzius.
Anodonta, (Bruguiére *em.*) Lamarck.
Prisodon, Schumacher.
Tetraplodon, Spix.
Castalina, v. Ihering.
Burtonia, Bourguignat.
Arconaia, Conrad.
Cristaria, Schumacher.
Lepidodesma, Simpson.
Pseudodon, Gould.
Leguminaia, Conrad.
Solenaia, Conrad.

Family MUTELIDÆ.

Genus MUTELA, Scopoli.[1]

As yet, we know very little of the anatomy of this or several other groups of African Naiades, and upon shell characters alone it seems difficult to decide whether this should be united with *Spatha* or kept separate. Typically the shells are quite distinct; those of *Mutela* being thin, elongated, and often furnished with quite well-developed taxodont teeth; while those of *Spatha* are solid, oval or oblong in outline, and have only a low, compressed tubercle or short ridge on the hinge line. But there are species which are so completely intermediate that it is very difficult to say to which group they belong. Most of them have unusually soft, brilliant nacre, generally inclining to bluish in the characteristic Mutelas, and to coppery in the Spathas. According to Clessin,[2] the mantle lobe of *Mutela* is united as far as the middle of the ventral margin; the animal has two stout siphons, and the shell gapes in front. Fischer states[3] that the palpi are long, curved and rounded at their extremities, and that the external branchiæ are united to the mantle throughout. Adams Brothers[4] say that in *Mutela* the inner gill is entirely united to the foot, while in *Spatha* it is free. If this distinction could be proved to be good throughout, it would be a sufficient character on which to base the two genera, but in *Unio* it is well known that the union of the inner gill with, or its separation from the foot, or the connection of the outer gill with the mantle, is very variable.

Mutela dubia, Gmelin, shows two or more slightly compressed elevations on the hinge line, especially in the left valve, and sometimes smaller denticles, while in *M. exotica*, Lamarck, the whole hinge line is often strongly crenulated.

The name *Mutelina*, which was proposed by Bourguignat[5] as a genus to include *Anodonta senegalensis*, Lea, and *Mutela rostrata*, Rang, is synonymous with *Mutela* and *Spatha*.

[1] Intr. Hist. Nat., p. 397, 1777.
[2] Kuster, Conch. Cabinet, IX, 1. Abth., p. 191.
[3] Man. de Conch., p. 1004.
[4] The Genera of Recent Mollusca, II, pp. 505–507.
[5] Esp. nouv. et gen. nouv. des grands Lacs Africains, p. 488, 1885.

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Genus CHELIDONOPSIS, Ancey.[1]

In 1886 Rochebrune[2] established the generic name *Chelidoneura* for *Mutela arietina*, Rochebrune. The name having been used previously for a mollusk of the family Philinidæ, Ancey changed it to that given above. I have not seen *C. arietina*, but a fine specimen of *C. hirundo*, v. Martens (which Rochebrune included in his genus), is in the National Museum collection, and is certainly a peculiar shell. It has the anterior dorsal part developed into a sharp point like a *Prisodon* or *Arconaia*, and a curious, elevated wing-like carina running from the beaks to about the middle of the posterior end, which most decidedly gapes, with a sort of diamond-shaped opening. Just in front of the posterior end each ridge is developed into a tubular spine, which, in the specimen I have seen, is nearly half an inch in height. One of these, in the shell examined, is closed by shelly matter; the other opens into the interior. The whole is covered with a thin, smooth epidermis, and in texture and color strongly recalls *Mutela*.

Genus SPATHA, Lea.[3]

This genus has been discussed under the head of *Mutela*. While most of the shells have a rich coppery nacre and are smooth externally, one species, which may perhaps be placed here, *Spatha vignoniana*, Bernardi, is of a greenish lurid texture throughout, and has the surface sculptured into a sort of reticulated and zigzag pattern, the only instance I know in which a Mutelid is truly sculptured. There is a low groove running down along the dorsal slope in this species, and the posterior end is somewhat angulated. I believe that the African Naiads, which were referred by the older authors to *Anodonta*, belong in this group or in *Mutela*, and that no true members of the former genus are found south of the Sahara. While most authors agree that *Spatha* has the mantle developed into siphons, yet in *S.* (*Anodonta*) *chaiziana*, Rang, the branchial opening is not closed.[4]

According to Clessin,[5] the laminæ of the gills are united in perpendicular rows.

The shell of *S. alata*, Lea, shows slight nodules in certain specimens embedded under the external nacre along the hinge line, which are no doubt vestiges of taxodont teeth.

Moncetia, Bourguignat,[6] is quite likely a group of compressed Spathas, which may possibly be worthy of subgeneric rank. Its author states that the beaks are smooth; that there is a tubercular eminence on the hinge line of the right valve in the cardinal region, without a cor-

[1] Conchologist's Exchange, II, p. 22, 1887.
[2] S. B. Nat. Fr., 1886, pp. 3–5, pl. 1, figs. 1–4.
[3] Trans. Phil. Soc., VI (n. s.), 1858, p. 141, footnote. Type, *S. rubens*, Lea.
[4] See Lea's Synopsis of the Unionidæ, p. 79, 1870.
[5] Kuster, Conch. Cab., part 234, p. 184.
[6] Esp. nouv. et gen. nouv. des Lacs Africains, pp. 34–36, 1885.

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responding one in the left, and a smooth lateral lamella as in *Margaritana;* that it has two ligaments, both internal, and three groups of muscular impressions. The figures represent what seem to be diseased or stunted specimens, and I can not say where the group should be placed, never having seen shells of it. It may not be a Mutelid, or even a Naiad.

Genus PLEIODON, Conrad.[1]

This genus, consisting of a few African species, has been much confounded in time past. Conrad gave it the above name in 1834, and it seems to me to be perfectly distinct from all others. In 1871 Gill placed the species with the genus *Iridina* (which is synonymous with *Mutela*) in a separate family,[2] which he called Iridinidæ, while Fischer[3] makes *Pleiodon* a mere section of the genus *Mutela.* The shells are solid, ovate in outline and inflated, with smooth, shining, greenish epidermis, and the teeth, which are irregularly taxodont, are strong, usually somewhat oblique anteriorly, and more or less perfectly V-shaped posteriorly, their bases pointing forward. In the middle of the hinge they are often broken and blurred, sometimes crossing the hinge plate in zigzag lines. The teeth in young shells are often quite oblique.

Pelseneer,[4] in an able paper on the anatomy of *Pleiodon*, states that the labial palpi are semilunar, with a long, straight attachment; that the gills divide the pallial chamber into two quite distinct spaces, so that there are three openings into the mantle cavity—pedal, branchial, and anal. It has a closed branchial siphon, and the mantle border is united for some distance forward.

Cameronia of Bourguignat[5] is based on characters which, according to the above writer, vary much in different individuals, and I doubt whether it is a valid genus. The shells are solid, inflated, with a heavy hinge plate, in which the teeth are somewhat taxodont, as in *Pleiodon.* Bourguignat claims distinction on account of its having elongated anterior teeth, a character which is not shown in many of the specimens he figures. In the shells I have seen, the hinge seems to be diseased, the teeth are blurred, and the plate is somewhat split up anteriorly, but crenulated, and I should hesitate before calling these ridges lamellar teeth. I should not give the group, at most, more than subgeneric rank

Genus BRAZZÆA, Bourguignat.[6]

Inflated, thin, shining, toothless shells, with smooth beaks, having a purplish interior, and numerous (4 or more) deep dorsal cicatrices. There is a strong, triangular escutcheon at the end of the ligament, and

[1] Journ. Acad. Nat. Sci. Phila., VII, 1834, p. 178.
[2] Arrangement of the Families of Mollusks, Smith. Misc. Coll., 227, p. 20.
[3] Manuel de Conch., p. 1004.
[4] Bull. Mus. Belg., IV, pp. 116-128.
[5] Moll. Nyanza Ouk., p. 19, 1883.
[6] Esp. nouv. et gen. nouv. des Lacs Africains, pp. 32-34, 1885.

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the left valve is dorsally winged, while the right is not. I have not seen any of these singular shells, but from the figures and descriptions I should think the genus was a valid one, and that it belonged with the Mutelidæ. It was proposed for *B. anceyi*, by Bourguignat.

Chambardia of Bourguignat, a new name for the Egyptian Iridinas,[1] probably contains nothing which can not be satisfactorily placed in other genera. The publication in which the genus is proposed is not accessible to me. All the foregoing genera of Mutelidæ are from Africa south of the Sahara desert, with the exception of the Nile, which is peopled with these forms to the Mediterranean. Some of the species extend south into the Cape region.

Genus GLABARIS, Gray.[2]

This generic name has been adopted by the Adams Brothers, von Ihering, and others, for South American Naiades with edentulous hinges, which had until 1847 been placed in *Anodonta*. So far as I know, no true Anodontas are found south of Mexico, all the Central and South American forms I have seen being undoubtedly members of the genus *Glabaris*. The shells of this group, though resembling those of *Anodonta* in the fact that they are without teeth, are really quite distinct, and when once the differences are understood, there need be no difficulty in distinguishing them.

The shells of *Glabaris* are usually of more solid structure than those of *Anodonta*, and some of them are covered with the peculiar clothlike epidermis which is found on a number of the Monocondylæas. The nacre is of a peculiarly soft, often brilliant and iridescent texture, in strong contrast to the lusterless interiors of most of the Anodontas. In a few of the species typified by *G. tenebricosa*, it is a sort of lurid greenish hue, but in these its tints are soft and rich. Frequently slightly elevated rays reach out from the cavity of the beaks, especially in those with the brightest nacre. There is in nearly all cases a well-defined and tolerably broad border of the prismatic layer shown around the inside of the shell, which is generally darker in tint than the nacre, and often semi-transparent. In the *G. lato-marginata* group this is especially dark and broad, being often as much as a quarter of an inch in width. It is caused by the fact that the mantle does not deposit nacre to the border of the shell. Traces of taxodont teeth have been noticed in some of the South American species by v. Ihering and the writer, and these are sometimes present in *G. granadensis* of Nicaragua.

According to d'Orbigny,[3] *Iridina* (*Glabaris*) *trapezialis*, Lamarck, and other allied species, are characterized by having distinct siphons, while in *G. membranacea*, Orbigny, which probably is the same as *G. lato-marginata*, Lea, the borders of the mantle are free at the siphonal

[1] Bourguignat, in Servain, Bull. Soc. Mal. France, VII, pp. 304–315, 1890.
[2] Proc. Zool. Soc., London, 1847, p. 197.
[3] Voy. Amer. Mérid., pp. 596, 617.

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region. The embryo, as v. Ihering has shown, is a lasidium. By the characters of the shell most of the *Glabaris* are closely related, and v. Ihering has placed these two species in the same group. Here, then, in another genus, is an example of the great variation of siphonal development in closely related forms, which helps to prove that the character is not constant. Dr. Lea found that in *G. wymani*, Lea, and *G. lato-marginata*, Lea, the branchiæ were united their whole length to the abdominal sac, and the palpi of both were rounded, and he stated that in this latter respect they differed from all North American Anodontas he had examined. The superanal opening was not united below. And in *Glabaris strebeli*, Lea, of Mexico, which is closely allied to the South American forms, he found the same kind of rounded palpi which were united only above. The genus is distributed from central Mexico all through Central and South America to Patagonia, but has not been found west of the Andes, though a number of Unios are met with in that region.

Genus LEILA, Gray.[1]

Conchologically *Leila* is very close to *Glabaris*. The color, form and texture of the shells are the same as in species of the Trapezialis group of *Glabaris*, and, like most of those forms, they gape more or less in the anterior ventral region. According to von Ihering *Leila* has siphons,[2] and the pallial line in most specimens is quite deeply and broadly indented in the siphonal region. But the latter character is often found in a less degree in the shells of *Glabaris trapezialis* and its allies, especially *G. sinuata* and *G. anserina*. Both *Leila esula* and *L. blainvilleana* occasionally show vestiges of taxodont teeth near the beaks. The range of the genus is much the same as that of *Glabaris*, but I do not know of its having been found in North America.

Genus MONOCONDYLÆA, d'Orbigny.[3]

This group was first described as a subgenus of *Unio*, and was afterwards given generic rank in the author's great work on the mollusks of South America.

Spix's name, *Aplodon*,[4] was preoccupied by Rafinesque, in Heliacea in 1819, and therefore it must be relegated to the synonymy.

The shells of this group are generally solid, with a rather rough, brownish or greenish, cloth-like epidermis. The right valve has a large tooth opposite the beak, and a smaller one some distance forward of it. The large tooth of the left valve fits the space between, and there are occasionally small scattered denticles on the hinge plate. According to d'Orbigny,[5] *Monocondylæa guarayana*, d'Orbigny, has long, rounded

[1] Syn. Brit. Mus., 1840, p. 142.
[2] Zool. Anzeiger, Nos. 380, 381, p. 2, 1891. See also Fischer, Man. de Conch., p. 1005.
[3] Guer. Mag. Zool. Cl., V, No. 62, p. 37, 1835.
[4] Test. Fluv. Braz., pl. XXV, figs. 1, 2, 1827.
[5] Voy. Amer. Mér., pl. LXVIII, fig. 7.

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labial palpi, which are attached in a curved line above, and which are not united posteriorly. Otherwise the animal does not seem to differ greatly from that of *Unio*.

Genus FOSSULA, Lea.[1]

In 1870, Lea separated *Monocondylæa fossiculifera*, d'Orbigny, from the genus in which it had been formerly placed, and gave it the above generic name. The shell is solid, and externally quite closely resembles that of *Glabaris lato-marginata*, Lea, but the hinge is peculiar. In that of the left valve there are two distinct humps, with a depression between, which latter is opposite the beak. In the right there is a large, blunt elevation which fits into this depression of the left valve; then behind this is a pit, and still behind it a smaller hump. Frequently a smaller set of denticles are seen above one or more of the pits, which project into a sort of ligament in the upper part of the hinge. This latter character is shown more plainly in a species recently named *F. balzani* by v. Ihering. The animal is said by this author to scarcely differ from that of *Glabaris*.[2]

Genus IHERINGELLA, Pilsbry.[3]

In 1859, Lea applied the name *Plagiodon*[4] to *Monocondylæa isocardioides*, Lea, but as that name had been preoccupied by Dumeril in reptilia (1835), Pilsbry proposed the name *Iheringella* for it, in honor of the eminent biologist von Ihering, who has done such excellent work among the Naiades. The type, *P. isocardioides*, Lea, resembles in form an *Isocardia*. The hinge appears as if injured, like that of a *Margaritana*. In the right valve are two irregular teeth under the beak, and a broken, saddle-shaped tooth in the left valve fits in between them. In each valve there are pseudolaterals which start under the beak and slope downward across the plate, and the whole surface of the hinge is covered—teeth and all—with irregular wrinkles and pustules. Conchologically it seems most closely related to *Monocondylæa*. The nacre has a peculiarly soft, greenish hue. The animal is unknown.

Genus MYCETOPODA, d'Orbigny.[5]

Orbigny first applied the above name to *M. Soleniformis*, Orbigny, and *M. Siliquosus*, Orbigny, characterizing the genus in a proper manner, and afterwards, in the "Voyage Amerique Méridionale," changed the name without explanation to *Mycetopus*, by which it is generally known. The former name will, I am sorry to say, have to supersede the latter.

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[1] Synopsis of the Unionidæ, p. 72, 1870.
[2] Archiv für Naturgeschichte, I, pt. 1, p. 65, 1893.
[3] Nautilus, VII, No. 3, p. 30, 1893.
[4] Proc. Acad. Nat. Sci. Phila., VIII, p. 79.
[5] Guer. Mag. Zool. Cl., V, No. 62, p. 41, 1835.

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I have discussed the genus somewhat at length under the head of *Solenaia* in this paper, and nothing more need be said regarding the shell.

The palpi, as in other genera of the Mutelidæ, are longer than wide. The mantle is open all around, there being no distinct branchial siphon. The anal siphon is only indicated by an oval aperture with a low border, and it is separated from the branchial opening by a sort of bridge. The branchiæ are very large, and the Adams Brothers state that the outer ones are entirely grown together.[1]

The foot is an enormous and greatly modified organ, very long and cylindrical, and near the lower part contracted like the neck of a bottle. From this the base swells out into a large button, which d'Orbigny, in the magnificent figure in his great work on South American mollusks, has represented as covered with low, rounded protuberances. The wall of the burrow corresponds to the shape of the animal, being narrowed in near the button and expanded above and below, and the foot could not be withdrawn unless its lower end was contracted. The unionoid characters of the animal have induced some authors to place it in the Unionidæ; by others it has been considered the type of a separate family, Mycetopodidæ.[2] But as it is known that other unrelated Naiades burrow in the same way, some of which have a strikingly similar foot, and that the shell has a wonderfully soft, silvery nacre, and that it never has a vestige of cardinal or lateral teeth, but sometimes faint traces of taxodont denticles, I think it may be safely placed in the Mutelidæ. The genus is found from southern Brazil northward to Central America. It may be here remarked that all the members of the Mutelidæ as herein classified are confined to Africa and South America, with the exception of a few *Glabaris*, which go up as far north as southern Mexico, and a single Central American *Mycetopoda*.

From the foregoing characters of the different genera placed in the Mutelidæ, we may deduce the following family description:

Shell generally without sculpture or angularities, smooth or rarely slightly sulcate, covered with a thick epidermis; *beaks nearly or quite destitute of sculpture, and never exhibiting the remains of an embryonic shell; nacre of a peculiarly soft, rich texture*, silvery, coppery, lurid or greenish, *generally surrounded by a wide, distinct prismatic border;* hinge with or without teeth, *which, when present, are always irregularly taxodont, and showing vestiges of this kind of dentition in occasional specimens in all the genera;* escutcheon large, triangular, and distinctly marked; muscular impressions variable; pallial line usually simple, but in some cases more or less inflected into a sinus posteriorly.

Animal: *Labial palpi large, oval or rounded below*, and usually *without free points, scarcely united posteriorly;* outer gills attached firmly on each side to the mantle and abdomen, so that the suprabranchial cham-

[1] Genera of Recent Mollusks, II, p. 504.

[2] Gray bestowed this name in the "Synopsis of the British Museum" in 1840.

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ber ending in the anal siphon is completely separated from the mantle cavity; *anal and superanal cavity united, continuing backward over the adductor muscle into a superanal chamber.* Mantle open or closed into more or less perfect siphons, *sometimes united for some distance forward. Embryo a lasidium, composed of three segments,* the anterior head-like, the median bearing a single shell, the posterior tail-like.

It will be seen from the above that the characters of the soft parts are quite variable, and I have italicized those in both shell and animal which seem to most constantly differ from the same in the Unionidæ. It is very probable that with a more thorough anatomical knowledge of the Naiades the descriptions will have to be a good deal modified.[1]

The following is a list of the genera I place in this family:

Mutela, Scopoli.
Chelidonopsis, Ancey.
Spatha, Lea.
Pleiodon, Conrad.
Brazzæa, Bourguignat.
Glabaris, Gray.
Iheringella, Pilsbry.
Monocondylæa, d'Orbigny.
Fossula, Lea.
Mycetopoda, d'Orbigny.

Although in time past the Naiades or pearly fresh-water mussels have often been placed in a single family, and though even v. Ihering, whose recent classification of the genera is, I believe, a natural one, has placed the two groups, Unionidæ and Mutelidæ, in one superfamily, and notwithstanding the fact that there are a few genera whose position on account of our lack of knowledge is doubtful, yet I think it quite probable that the relationship between these two great groups is not a very close one.

It is true that the animals themselves do not seem to altogether bear out this assertion. The character of the presence or absence of siphons, on which the families have generally been founded is, as I think I have conclusively shown, utterly variable and worthless. There is usually some distinction in the form and the union or nonunion of the labial palps, but these characters are not perfectly constant, and even if they always held good, they would be of little importance. Ihering is authority for the statement that in all the South American and African Mutelidæ (and all the genera belong in these two continents) the outer gill-leaves on each side are firmly attached both to the mantle and abdomen, thus completely separating the suprabranchial cavity from that of the mantle back to the anal opening. This, however, according to that most excellent authority, occasionally occurs in the Unionidæ of the northern hemisphere.

[1] There will doubtless be found great variation in the matter of union of the mantle and gills in many other Pelecypods. Jackson observed in some specimens of *Perna ephippium* that the two pairs of gills were separated from one another throughout their length, whereas in other specimens the two median gills were connected by concrescence at their dorsal border, thus uniting the two pairs as in *Ostrea*. The degree of union varied in different specimens, the gills being united for their whole extent, or only posteriorly. (Phylogeny of the Pelecypoda. Mem. Bost. Soc. Nat. Hist., IV, No. VIII, p. 326, 1890.)

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It is in the characters of the embryo and the shell that we find the great vital distinctions between these families. In the Unionidæ the embryo, perhaps without exception, is a *glochidium*, which is probably characteristic of the nepionic stage of all the genera in the family. The embryo of the South American Mutelidæ has, wherever examined by v. Ihering, proved to be a *lasidium*, and, although perhaps the relation of the African mutelid groups may not be so close to those of South America as is that of the latter among themselves, yet I have no doubt that their embryos will prove to be something very much like a lasidium. This peculiar stage is, so far as I know, entirely unique among Pelecypods, and though by the character of *taxodont* teeth the mutelids show affinities for *Nucula*, *Arca*, *Pectunculus*, and the like, yet by the evidence of their embryos they seem wholly unrelated to any other lamellibranchs.

The irregularly taxodont teeth which characterize the Mutelidæ are totally different from the schizodont teeth, which are found more or less developed in every genus of the Unionidæ. The peculiar cartilage pits of *Fossula* resemble to some extent those in *Perna*, and suggest a possible distant relationship with this and allied genera. On the other hand, it would seem reasonable to suppose that the unionids had their closest affinity with other schizodont families.

II. GEOGRAPHICAL DISTRIBUTION OF THE NAIADES.

In mapping out the general distribution of the Naiades, although they are all confined to the fresh waters of the globe, it will be found that they fall into provinces something in the same way as do the other members of the animal kingdom. So nearly do these areas coincide in a number of cases with those of generally recognized regions of animal life, that in several instances I have applied the same names to them. To a considerable extent, as would be expected, these divisions of Naiad life are bounded by the sea, by deserts, and mountain chains which act as watersheds for different river systems. Yet none of these in all cases effectually restrict the distribution of the fresh-water mussels; and it is true that in several instances the borders of a Naiad region are not marked by any tangible natural barriers.

The Palearctic Region.—This, the largest region of Naiad life, includes in a general way the whole of Europe, Africa (excepting the Nile), north of the Desert of Sahara; all of Asia north of the Stanovoi and Altai Mountains, including, probably, the greater part of Afghanistan and Beloochistan, Persia, Arabia, and Asia Minor; and all of North America that is drained into the Pacific. This vast region, covering an area of perhaps 16,000,000 square miles, is inhabited by a single and remarkably homogeneous Naiad fauna. One species characteristic of this province, *Unio margaritiferus*, Linnæus, is found in all parts of Europe except the region along the Mediterranean; also throughout Siberia; in northern Japan, which stands on the border between this and the Oriental region, and in that part of this province in North Americ

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lying north of about 40°; occupying in all an area in the palearctic region of something like 9,000,000 square miles. The Amoor River, which takes its rise in Siberia and Mongolia south of the Stanovoi range, has a mixed Naiad fauna whose characters partake of the Palæarctic and Oriental provinces. *Unio pictorum*, a species common to all Europe and Siberia, is found at Khabarovka, in the Amoor Valley, as well as *Anodonta magnifica*, Lea, *A. cellensis*, Schroeter, and *A. plicata*, Solander, which is synonymous with *Cristaria discoideus* of Lea, the latter three being common to China.[1]

According to Middendorf,[2] *Anodonta herculea*, Middendorf, a Japanese species, which is a *Cristaria; Unio mongolicus*, Middendorf (=*Unio margaritiferus*, Linnæus?), and *Anodonta cellensis*, Schroeter, are found in the Amoor region. His *Unio complanatus*, Solander, a common New England species, which he credits to Siberia, is, according to his figures, without lateral teeth, and appears to be a stunted form of *Unio margaritiferus*.

Schrenck[3] gives the following list of species of the Amoor Valley:[4]

Unio grayanus, Lea.
* *U. pictorum*, Linnæus.
* *Unio* (*Marg.*) *margaritiferus*, Linnæus.
Anodonta plicata, Solander.
A. magnifica, Lea.
* *Unio mongolicus*, Middendorf.
* *U.* (*Marg.*) *dahuricus*, Middendorf.
* *Anodonta anatina*, Linnæus.
* *A. cellensis*, Schroeter.

His *Unio grayanus* is certainly not that species, but a shorter, heavier shell, belonging, however, to an Oriental group; and the *Unio mongolicus* is most likely a form of *Unio margaritiferus* with imperfect laterals.

The southern limit of the Palæarctic Region in North America can not be accurately given, but it probably extends to near the Isthmus of Tehuantepec, as one of the common Californian Anodontas has been found in Oaxaca.

In all this vast area there are perhaps not more than 50 valid species of Naiades, which belong to the genera *Unio*, *Leguminaia*, *Anodonta*, and the species of *Cristaria* alluded to, though the new school of conchologists have considerably multiplied the genera and have run the specific names up into the thousands. The species are, for the most part, small to medium in size, without conspicuous sculpture or angles, or, as a rule, any bright patterns of coloring.

The group of Anodontas typified by the well-known *A. cygnea*, Linnæus, *is distributed over this entire region*, all the forms found in the Pacific drainage of North America either belonging to it or being, I think, closely related. One species, *A. yukonensis*, Lea, from the Yukon River, Alaska, is absolutely identical with specimens of *Ano-*

[1] On the authority of Mousson (Journ. de Conch., XXVII, p. 26).
[2] Malacoz. Rossica, Sib. Reise, 1847–1851, p. 273.
[3] Reisen und Forsch. im Amur-Lande, 1854–1856, p. 694.
[4] Those belonging properly to the palearctic region I have characterized by an *; the others are Oriental species.

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donta beringiana, Middendorf, collected by Dr. Dall at Petropaulovski, Kamchatka. This I have verified by comparing the types with Dr. Dall's shells.

Unio ravistissus, Kobelt, of Afghanistan, appears to be a member of one of the great European groups. Two Unios have been credited to Oregon, *U. famelicus* of Gould, and *U. oregonensis* of Lea. The types of both of these species are in the National Museum collection, and I can say without hesitation that the former is a young shell of *U. multistriatus*, Lea, of Brazil, while the latter is only an old, rather large and solid *U. rowelli*, Lea, of Central America. *Unio margaritiferus*, Linnæus, is the only species of the genus known at present in the Pacific drainage of North America.

Although there is a slight mingling of the forms of this and the Oriental regions in the Amoor Valley and northern Japan, I only know of one group, represented by a single species, belonging to the Palæarctic province which is extralimital, this being *Unio margaritiferus*, Linnæus, which is found in the Upper Missouri of the Mississippi area, and in eastern Canada and New England of the Atlantic drainage. Of its distribution, more will hereafter be said. On the other hand, I do not know of a single Naiad belonging to any other province, which is found within this great region.

The Ethiopian Region.—All the continent of Africa lying south of the Desert of Sahara, including the Nile to its mouth, is peopled by a common assemblage of Naiad life. The only genera of the Unionidæ represented in this region are *Unio*, which is distributed over the whole territory, and *Burtonia* (if it be a valid genus), with a few species confined, so far as is known, to the region of the Great Lakes. All the Unios are small to medium in size, and are not particularly striking in any way. A large proportion of them are more or less covered with slight zigzag or reticulated delicate sculpture, and in this particular, as well as in form and texture, they recall the Unios of India. This is especially true of the forms known from the Cape region. A few species which I have not seen, have been reported on rather doubtful evidence from Madagascar.

Within this area are found five genera of the Mutelidæ: *Mutela*, *Spatha*, and *Pleiodon*, having a wide distribution, and *Brazzæa* and *Chelidonopsis*, which are probably more restricted. Little is known as yet of the Naiades of this great territory, but long ago it was remarked by Morelet that the fauna, including the land and fresh-water mollusks of this entire region, was remarkably homogeneous. Several of the groups of *Unio* and of the Mutelidæ appear to be distributed over the greater part of the province. So far as I know, no species or group of the Naiades belonging within it is found outside of the region, nor is there an immigrant from any other area within its borders. The ocean and the Desert of Sahara appear to be absolute barriers to the ingress or egress of Naiad life.

The Oriental Region.—All that part of Asia lying south of the great

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Thibetan plateau, including, probably, the Indus on the west and the Hoang-Ho on the northeast, is inhabited by a peculiar Unione fauna. With this region must be included Japan, Korea, Manchooria, Formosa, the Philippines, and probably all the islands of the Malay Archipelago, which are peopled with Naiad life, to and including the Solomon group. The genus *Unio* is everywhere abundant throughout this area, and *Pseudodon* is common to nearly all of it. A magnificent set of Anodontas is developed in northern China, and in this region *Cristaria*, *Lepidodesma* and *Arconaia* are found. *Solenaia* inhabits the greater part of the area.

Dr. Lea was led to believe that two or three of the Unios of the southern part of this region were found in Australia, but later he was convinced that this was an error, and that no species of the two families is common to the Oriental and Australian regions. The Naiad fauna of this region is magnificent and diversified, and almost rivals that of the Mississippi Valley in vigor, size, solidity and variety of forms. Both Dr. C. A. White and von Ihering believe that the Unios and Anodontas of this area are closely related to those of the central part of North America. Not only does there seem to be a general relationship among a large number of the Naiads of this province with those of the Mississippi basin, but several Oriental groups are apparently so close to those of our own region that it is well-nigh impossible to separate them. Thus, the Asiatic Anodontas typified by *A. woodiana*, Lea, if found in the United States, would be placed by most students with *A. plana;* the Chinese Unios of the group of *U. housei*, Lea, and *myersianus*, Lea, are evidently quite near the *Alatus* assemblage; *Unio superbus*, Lea, is very much like our *U. capax*, Green, and a number of the tuberculate forms of China could almost be placed in the American groups of *U. lachrymosus* and *U. pustulosus.*

Certain peculiarities of shell growth are remarkable among the Naiades of this entire region. One of these is the loss or partial degeneration of the hinge teeth, and another is the remarkable development of vertical tooth striation, to both of which attention has already been called in this paper. The third is the singular contortion of many of the species, of which there are three varieties. The first and simplest is a mere bending of the posterior part of the shell, either to the left or right, something like that of a *Tellina*, which is seen in two or three groups of elongated Chinese species. Some of these forms are bent into a strong curve. The second is a twisting of the shell on its axis, which occurs in the Arconaias and some of the Unios.[1] These two forms of distortion may occur in the same species. The third and most strange form of irregular growth is seen in a number of very solid, oval and somewhat

[1] *Arconaia provancheriana*, Pilsbry, which is twisted on its axis like a *Parallelopipedon*, is no doubt a distorted form of *Unio complanatus*, Solander, from Canada, and does not come from China, as has been surmised. (See Naturaliste Canadien, XIX, p. 171, 1889.)

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pustulous species, in which one valve appears as if it had been pushed downward when in a plastic state, and is always less inflated than the opposite one.

These peculiarities are not characteristic of entire groups, as they may be met with in one species and absent in closely related forms.

The Australian Region.—Australia, Tasmania and New Zealand are peopled with a very distinct set of Naiades, consisting, with the exception of the single *Solenaia* which has been referred to the former island, of Unios only. It may be possible that when New Guinea is thoroughly explored, some of the peculiar species of Unios found in Australia may be discovered, as it is believed that these two islands were connected during Tertiary time. Only a moderate number of species are found in this region, as Australia has few streams, and all, or nearly all, of them either go dry or are reduced to mere disconnected pools in time of drought. In general, the shells of this region are oval in outline, smooth, of a dull greenish olive or brownish tint, and without other patterns of color marking. Some of the forms have a slight development of concentric ridges, and only two species are known which have any other sculpture: *U. cucumoides*, Lea, which is somewhat tuberculous, and *U. napeanensis*, Conrad, which has rather sharp, pointed knobs or corrugations, extending out for some distance from the beaks. *Unio dorsuosus*, Gould, the type of which is in the Museum collection (No. 5925), is, I have no doubt, a young *U. napeanensis*, and is said to have come from the Fiji Islands.[1]

At the beaks of this shell the sculpture is imperfectly radial, much resembling that of the South American species. The very few perfect beaks of Unios of this region which I have seen, have a somewhat zigzag or curved radial sculpture, indicating, as do the form and color of the shells and the similarity of the soft parts, a close relationship with the South American species. The so-called *Alasmodonta stuarti*, from Australia, is merely a *Unio* with compressed, feebly developed teeth. No species of this region is known to be extralimital, and the *Solenaia*, if really from Australia, is the only member of a foreign group represented in this region.

The Mississippi Region.—All the waters that are carried to the Gulf of Mexico through the Mississippi River are filled with a common assemblage of Naiades, consisting of Unios and Anodontas. In fact, this fauna occupies almost exclusively all the streams emptying into the Gulf, from the Rio Grande on the west to the Chattahoochee River on the east, and beyond this either the species of this region or those belonging to its groups are scattered from Central America to North Carolina. To the northward, other species or members of groups belonging here have passed into New England and extended down to

[1] Gould says (U. S. Expl. Exp., XII, p. 431): "This shell was marked Fiji Islands, probably by some accident, as I doubt not that it came from eastern Asia." It is no doubt an Australian, and not an Asiatic or Polynesian species.

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southern Virginia and even into Georgia. The Red River of the North, the Mackenzie, the Great Lakes, most of the lower peninsula of Michigan, and the southernmost portion of Canada are, for the most part, peopled with Mississippi Valley species..

No equal area on earth has such a diversity of Naiad life or such magnificent shells. Here are found the largest species in the world; here are forms with knobs, pustules, angles, lobes, and concentric sculpture. The nacre of many of them is wonderfully rich in tints of silver, pink, purple, salmon or red, and it is equaled in beauty by the elegant patterns of external painting, in stripes and mottlings and delicate hair lines. Perhaps twenty or more species of this region are extralimital, and about half as many from other areas occur within its borders.

The Atlantic Region.—East of the Appalachian chain, and occupying all the rivers and streams from Florida to Labrador that drain into the Atlantic, there is a set of Unionids, consisting of Unios and Anodontas, generally moderate in size, thin in structure, and for the most part without strong angles, sculpture, or brilliant coloring. Toward the southern part of this region the forms are immensely variable and puzzling, and I do not know of any other area in the world in which it is so difficult to satisfactorily separate species and groups. Although both in the southern and northern part of this province the forms of the Mississippi Valley have entered freely, until they have met and overlapped, yet there are perhaps not more than one or two species which belong in this region or members of any of its groups that appear in the waters of the Mississippi drainage proper. *Anodonta fragilis*, Lamarck, a form characteristic of the Atlantic province, is found in several places in the Mississippi area, notably in Minnesota; and *Unio radiatus*, Lamarck, is doubtfully reported from the St. Croix River, Wisconsin.

The specimens of *Anodonta footiana*, Lea (another northern form), said to come from the Illinois River, are no doubt *Anodonta ovata*, Lea. There are scarcely a dozen Mississippi drainage species found within this region.

The Neotropical Region.—The entire continent of South America forms a single region of Naiad life, containing four genera of Unionidæ (*Unio*, *Prisodon*, *Tetraplodon* and *Castalina*) and six of Mutelidæ (*Glabaris*, *Leila*, *Monocondylæa*, *Fossula*, *Iheringella* and *Mycetopoda*).

The Unios are generally oval or rounded, moderate in size, usually slightly sulcate, and covered with a uniform brownish or greenish brown epidermis. All have radial beak sculpture, and very few have any other than what I have mentioned.

The genus *Unio* is represented throughout the entire area, and strangely enough the great Andean chain does not form a barrier between groups. The assemblage typified by the well-known oval, compressed *Unio ellipticus*, Spix, seems to be scattered over this whole area, and species belonging to this group in Peru and Chile on the Pacific Slope of the continent can scarcely be said to differ from forms

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on the other side. I do not know that any other group of Unios is represented on the western slope, and so far as I am aware, none of the other genera have as yet been met with in the rather limited drainage of that region.

The great group of *Glabaris* typified by *G. trapezialis*, Lamarck, a very natural and closely related assemblage, is well represented, no doubt, throughout all the eastern and southeastern drainage of South America, from well down in Argentina to Central America and even southern Mexico. Indeed, the typical species is in the Museum collection from the streams of Argentina to Lake Maynos in the interior of Peru, the San Francisco River, Brazil, and the Rio Negro on the north. The group is well represented in Central America and southern Mexico by *G. bridgesi*, Lea, and allied forms. A single species, *G. leotandi*, Guppy, is found in Trinidad. No species and only three or four groups of this region are extralimital.[1]

The Central American Region.—All Central America, including, perhaps, the most of the Isthmus of Panama, and all of Mexico except the strip west of the Cordillera, together with Yucatan and the Island of Cuba, form a single Naiad province which is peopled with a large number of *Unios*, a fair representation of *Anodontas*, a single *Mycetopoda*, and a few *Glabaris*. The fauna consists really of three elements, which no doubt represent as many migrations.

First.—A large number of Unios, constituting the greater part of the fauna, which by their solid, sometimes angular and inflated forms and often pustulous or somewhat plicate sculpture, indicate evident relationship to groups in the Mississippi Valley. The groups showing these resemblances are placed opposite each other in the following table:

Relationship of Central American and Mississippi Valley Unios.

Central American region groups.	Mississippi Valley groups.	Central American region groups.	Mississippi Valley groups.
Unio pliciferus	U. crassidens.	Unio scutulatus	U. alatus.
Unio mexicanus	U. crassidens.	Unio popei	U. monodontus.
Unio rowelli	U. luteolus.	Unio usumasintæ	U. trigonus.
Unio cuprinus	U. alatus.	Unio usumasintæ	U. lachrymosus.

The group of Central American Unios, typified by *U. aratus*, does not seem to have a parallel in any assemblage of Mississippi Valley forms, but is undoubtedly related in a general way. The Unios of this region

[1]Attention may be called to the curious fact that a number of the South American species of Unios are imitated by certain *Glabaris* which very strongly resemble them externally. Thus the orbicular Unios typified by *U. nocturnus* have their parallel in *Glabaris* in a section typified by *G. lato-marginata*, and the elliptical Unios of the *Casablancæ* group are balanced by *G. puelchana*, etc. *Unio delodontus* and its allies are offset by *G. wymani* and others, and the elongated solid *U. parallelopipedon* and a few others have their counterpart in *G. ensiformis*, which sometimes so closely resembles the members of this group that anyone would at once place it with them unless the hinge was examined. There is no relation whatever between the genera. Their resemblances are probably adaptive.

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below the Isthmus of Tehuantepec, as well as those of Cuba, are remarkable for their sulcate sculpture. This character is noticeable even in species which are pustulous or otherwise sculptured, and is seen in groups, the members of which in Mexico are smooth or nearly so.

Second.—A considerable number of Unios and Anodontas, some of which extend down into Central America, which are either absolutely identical with well-known forms in the Mississippi Valley or belong with the assemblages of that region. The following groups of the latter province are represented. The group of *Unio plicatus* is represented by *Unio eightsi*, Lea, which is found south to Vera Cruz, and is merely a synonym of *U. multiplicatus*, Lea, a common form in the central United States. There are one or two other species of this group which range south into Central America. Quite a number of species of the group of *Unio alatus*, such as *Unio tecomatensis*, Lea, *U. umbrosium*, Lea, *U. purpuratus*, Lamarck, and the like, are found in Mexico, and one species something like *Unio tenuissimus* (*U. delphinulus*, Morelet), is found in Honduras. The group of *Unio gibbosus* is represented by *Unio discus*, Lea, a compressed, ponderous species in Central America; that of *Unio luteolus* by a nearly typical species *U. hydianus*, Lea, and that of *Unio anodontoides* by the form of the same name, all of which species extend across the Rio Grande River. *Unio couchianus*, Lea, of the *Lachrymosus* group, is a Mexican species, and it is probable that representatives of other northern groups will be found in this region. *Anodonta henryana*, Lea, of Mexico, is scarcely distinct from *A. imbecillis*, Say, of the Mississippi Valley; and the group of Anodontas, of which *A. grandis*, Say, may be considered the type, has several representatives in the northern part of the province.

Third.—The few *Glabaris* and the *Mycetopoda* heretofore mentioned, which are found in the southern part of this area. Only about a half dozen species of this region are found in the United States, and perhaps as many belonging to that country extend into Mexico, though these numbers will probably be increased with more thorough exploration.

DISTRIBUTION IN TIME AND GENERAL CONCLUSIONS.

Unio and *Anodonta* have been believed by some authors to extend well back into the Paleozoic, and, while this may quite probably be true, yet I do not think the evidence is sufficient to demonstrate it.

Two or three species of Unios were collected by Professor Cope in the valley of Gallinas Creek, New Mexico, from strata which he regarded as of Triassic age.[1]

These shells were so broken as to be hardly recognizable, though they are no doubt Unios. One of them, however, was described by Meek under the name of *Unio cristonensis*,[2] but it may be as well to state

[1] Ann. Rept. Expl. and Sur. west of the one-hundredth meridian, 1875, p. 81.

[2] Ann. Rept. Expl. and Sur. west of the one-hundredth meridian, 1875, p. 83.

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that there is some little doubt as to whether the strata in which they were found is Triassic or Jurassic.

Something like a year ago a half dozen species of fossil Unios were sent to the writer by Mr. E. T. Dumble, of the Geological Survey of Texas, which came from what are believed to be fresh-water Triassic beds in that State. Numerous valves of one of the species show perfect cardinal and lateral teeth, which do not seem to differ from those of many recent species.[1] These six forms, though not particularly striking in outline or appearance, belong to at least as many different groups, and do not show any more relation to each other than a half dozen specimens would if taken at random from different parts of the world. One of them is somewhat triangular in outline and compressed, with cardinal teeth much like those of the South American forms; another has slight, radiating striæ on the posterior part, and a third species, which resembles some of the forms of *U. pictorum* of Europe, *has strongly developed, radial beak sculpture!* The fact of this diversity would go to show that the genus had been, in all probability, a long time established at the time these were living. A few species have been found in the Jurassic beds of the western United States, some of which seem to be prophetic of groups which are living to-day in the Mississippi Valley, and the forms which are known to be Cretaceous from that region bear out this prophecy. But when we come to the lacustrine or estuary strata of the Laramie group in this same territory, we find a most astonishing resemblance to forms now occupying the central United States. These beds are believed by some to be Upper Cretaceous; by others they are referred to the Lower Eocene, and Dr. White, whose labors in this field are so well known, believes that the waters in which they were deposited were slightly brackish; and in fact the Unios and other fresh-water shells of that region are often found associated with *Cyrena*, *Ostrea* and *Anomia*, genera which now live in estuaries.

In the Laramie beds, species are found evidently belonging to such groups as that of *Unio plicatus*, *U. perplexus*, *U. gibbosus*, *U. clavus*, *U. metanever*, *U. securis*, *U. alatus*, and *Anodonta grandis*, and there are forms from these strata which could hardly be separated from living species if the latter were fossilized. Dr. White has called attention to the fact[2] that the anterior portion of many of the elongated species of these beds is greatly shortened, and this character is observable in a number of species in China. Whether the Naiades originated in North America or the Old World is not now known. At any rate, I do not think any careful student can examine a good series of species from the

[1] These species were sent to the writer to be named and described, and a paper was prepared with descriptions and figures, to be published in the report of the Geological Survey of Texas. On account of the lack of appropriations for continuing the work, the paper was not published by the Survey. The National Museum has undertaken its publication, and it will shortly appear in the present volume of Proceedings (pp. 379-383).

[2] Third Ann. Rept. U. S. Geol. Surv., p. 431.

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Oriental region, without being convinced that the Unione fauna of that area is somewhat closely related to that of the Laramie beds and the Mississippi Valley, and the conclusion seems reasonable that a migration took place, perhaps during or shortly after the Laramie epoch, over an old, now submerged, landway, either from Asia to North America or *vice versa*. It is, I believe, more probable that this fauna developed in the western continent than the eastern, for, as we have seen, a few prophetic types of it appeared in the North American Jurassic, while the earliest recorded existence in the Old World of species which seem intimately related to it is in the later Cretaceous or earlier Tertiary. While some eight or ten groups of Unios and Anodontas now living in the Oriental region bear such a strong resemblance to similar assemblages in the United States that at first sight they seem to be the same, I believe every one of them to be distinct, and it seems probable, when it is taken into consideration how slowly the Naiades change, and the fact that the forms of the Laramie groups have scarcely altered specifically in our own country, that if any such migration and separation took place, it occurred a long time ago.

It is quite likely that about this time members of some of the Laramie groups found their way into Mexico, Central America and Cuba. It is very probable that this area was separated from South America at that time, and for a considerable period since, as no interchange of Naiades is known to have taken place between the continents until perhaps during the Pliocene, or at least since the last union of land areas took place. No North American form is found in South America, and the few *Glabaris* and the *Mycetopoda* that have entered the Central American province from the south, have scarcely changed specifically. This Laramie *Unio* fauna in Mexico and Central America has every appearance of having been in some way isolated from the rest of North America, as if it had developed under insular conditions. Almost all of the older groups of the Central American region have their analogues in the Mississippi Valley to-day, yet very few species of these Mexican groups come north of the Rio Grande River; and while there is a slight mingling of forms of the two provinces, yet the groups can be separated, and the southern Naiad fauna has a distinctive appearance, notably in the much softer, more silvery, nacre, and an indefinable difference in the epidermis. I should say that these older Central American fauna groups bore about the same relation to those of the Mississippi Valley as do many of those of the oriental region. Judging from the apparent evidence of the Naiades, one would suppose that after the migration of these old forms into Mexico and Central America, they were isolated from the rest of North America long enough to take on certain peculiarities, and that after this the two areas were connected again, and that since the connection a few species of Unios and Anodontas of the present Mississippi Valley groups had migrated southward. I am aware that what is known of the geology

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of this region does not seem to support the idea of any separation of Mexico from the rest of North America during Tertiary time, but I simply give what appears to be the evidence of the Naiades.[1]

It is possible that at some time during the occupation of this region by the older Naiad fauna there may have been a strait through the present Isthmus of Tehuantepec, which separated Central America from Mexico. The strongly sulcate sculpture of most of the Unios of this lower region may have developed under insular conditions, or it is possible that it is wholly due to climate.

The Naiad fauna of the Atlantic area, while consisting generally of moderate-sized Unios and Anodontas, without, as a rule, any striking characters, was, I believe, developed from that of the Mississippi Valley, but it has long been separated by the Appalachian chain. *Unio* (*Anodonta*) *undulatus*, Say, of the Northeastern States, is only a mere variety at best of the *U.* (*Anodonta*) *edentulus*, Say, of the Mississippi drainage. *Unio* (*Margaritana*) *marginatus*, Say, found in the former region, though smaller and more delicate, is identical with the western species. *Unio radiatus* of New England belongs to the western *Luteolus* group, and in some cases approaches so close to the type that the two cannot be satisfactorily separated. *Unio ochraceus*, Say, and *U. cariosus*, Say, belong to the Mississippi group of *U. ventricosus*, while the groups of *Unio* (*Margaritana*) *calceolus* and *Unio pressus* are about equally developed in the two regions. The migration of these forms has no doubt been made around to the northward of the Appalachian chain, as the species belonging to these groups in the Atlantic drainage are abundant in New England, but gradually vanish as we go southward. South of the dividing range, the relationship is still more apparent. The great Mississippi Valley groups of *Unio tetralasmus*, *U. subrostratus*, *U. crassidens*, *U. parvus*, and *U. ventricosus* are all well represented in the Atlantic drainage of Georgia, Florida, and in some cases as far north as North Carolina, though there seems to be a slight separation of the two areas between the Ocmulgee River, which drains into the

[1] I quote from a letter received from Mr. H. A. Pilsbry, regarding the evidence of the land and fresh-water snails in this connection: "Now as to Mexico, we have there in the south a 'tincture' of South American types, evidently of recent origin. The *Solariopsis* and *Labyrinthus* very likely came north in or since the Pliocene elevation of the isthmus. The Melanians of Mexico are distinctly South American. Besides, Mexico has in the *Eucalodium*, *Holospira*, *Glandina*, etc., element a distinct fauna, *suggesting insular conditions both from the West Indies and North America*, but nearer the former. At all events, it looks as if the fauna of northern Texas and New Mexico is a recent mingling of the two faunas, the Polygyras moving south, and *Holospira*, *Bulimulus*, etc., moving north. How much this appearance is due to mere isotherms, I am not prepared to say; but still, without having any tabulation of the faunas before me, it looks as if to a peculiar nucleus of genera which evolved their differential features on Mexican soil had been added lately an element from South America, another from the West Indies, a third from the United States, these introduced factors being still far stronger toward their respective points of ingress."

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Atlantic, and the Flint River, which empties into the Gulf. The great group of *Unio buckleyi*, which is so characteristic of Florida, the coast region of Georgia, and South Carolina, is so closely related to that of *Unio crassidens* on the one hand and *Unio complanatus* on the other, that the systematic position of many of their species is wholly uncertain. Again, the group of *Unio fisherianus*, also characteristic of the Atlantic region, almost insensibly merges into that of *U. buckleyi*, through such forms as *U. aheneus*, Lea, *U. oscari*, B. H. Wright, and *U. hazelhurstianus*, Lea; and the small group typified by *U. downiei*, Lea, inhabiting Georgia and Florida, shows about equal relationship to those of *U. crassidens*, *U. buckleyi*, and *U. complanatus*.

In 1868 Lea described a number of fossil Naiades[1] from a marl bed near Camden, New Jersey. He believed this bed to belong to the Greensand of the Cretaceous, and noticing the strong resemblance of the forms to many now living in the United States, gave them names indicating this resemblance. The age of these beds is uncertain, but is probably more recent than what Lea supposed. The fossils are all casts of a somewhat ferruginous marl, and are quite imperfect, but among them are forms strikingly like *Unio anodontoides*, *U. rectus*, *U. complanatus*, and *Anodonta corpulenta*, and I think it not unlikely that they are in most cases the remains of living species, and that the beds are not older than the Pliocene. At any rate, they seem to show a much more intimate mingling of Atlantic and Mississippi forms at the time they lived than is now known to exist anywhere in either of the two regions.

As I have shown before, many of the species of the Mississippi Valley extend into Canada; they occupy almost exclusively the southern peninsula of Michigan, the Great Lakes, the Red River of the North, and the drainage system of the Mackenzie. This migration, which is entirely distinct from the earlier mingling of eastern and western species, is due, no doubt, entirely to the influence of the Glacial epoch. It is now generally admitted that during this time a vast cap of ice covered a greater or less extent of the Arctic and North Temperate regions of North America, and that at the close of the Ice age the southern edge of this cap gradually melted back for some distance from its extreme limit. North of the Height of Land in British North America great lakes were formed, which could only drain into the Mississippi Valley, since the wall of ice on the north and east formed a barrier in that direction. Several of these ancient drainage beds have been discovered; one near Chicago, another at the western end of Lake Superior, by which the water flowed down the St. Croix River; a third down the Minnesota River by way of the Red River of the North, and still another along the Maumee across to the Wabash.[2] It is probable there was an overflow down the Missouri River, as *Unio margaritiferus* is found in the upper waters of this stream—the only point where it is known to occur in the Mississippi basin.

[1] Proc. Acad. Nat. Sci. Phila., XX, pp. 162–164, 1868.

[2] See Popular Science Monthly, XLVI, No. 2, p. 217.

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Numerous species of Naiades no doubt pushed up from the Mississippi basin into these lakes, and when the ice cap finally melted they occupied much of the area of the Mackenzie and St. Lawrence systems. *Unio margaritiferus*, which is circumboreal, is not known to exist in the central British American region, but is found in eastern Canada and New England. It is quite probable, as has been suggested by Wetherby,[1] that this species may have extended across this whole area in pre-Glacial times; that the onward movement of the ice cap exterminated it in this central area, and that it was driven southward to the east of the Appalachian chain, where it still survives. This ice cap may have also driven out and destroyed much of the Atlantic drainage fauna, which was afterwards replaced by the more vigorous Mississippi Valley forms.[2] The Atlantic drainage group of Anodontas typified by *A. fluviatilis* seems to be closely related to the *Cygnea* group, and may have been separated from the latter by the ice sheet.

In the Old World, *Unio* and *Anodonta* are believed by Ludwig[3] to date back to the Carboniferous. The forms which he refers to these genera are from Rhenish Westphalia, and are small, oval, oblong shells, one of which has sulcations on the beaks. From the figures of the hinges, I greatly doubt whether the species referred to *Unio* belong to that genus. The few Unionidæ known from the Old World Jurassic and Cretaceous strata do not seem to show decided relationships with any other Naiad fauna. *Spatha galloprovincialis*, Matheron, which was described by its author as a *Unio*, is believed by Sandberger to belong to the former genus.[4]

In the figures of this species given by the author, the shell bears some resemblance to a *Spatha*, but is very different from any species I know of belonging to that genus, in the character of the beak sculpture. In *Spatha*, the umboes are smooth or nearly so, as are the shells of the Mutelidæ in general. This species has strongly concentrically sculptured beaks, the ridges ending in a very sharp angle posteriorly. It may possibly be a *Leguminaia*.

Several fossil Unios are known from Siberia and India, from what are believed to be Tertiary strata. These resemble the solid forms of China and the Mississippi Valley, and *Unio bituberculatus*, v. Martens, from the former country, is very much like *Unio perplexus*, Lea, from the Ohio River.[5]

In examining the fossil Tertiary Naiades of eastern Europe, one can not help noticing the wonderful resemblance of certain forms to well-known groups in the Mississippi Valley. Regarding these species and

[1] Journ. Cin. Soc. Nat. Hist., July, 1881, p. 7.

[2] See paper by the writer in Proc. U. S. Nat. Mus., XVI, pp. 991–995.

[3] Palæontogr., VIII. Die Najäden der Rheinisch-Westphalischen Steinkohlen-Formation.

[4] Land und Süsswasser Conch. der Vorwelt, p. 95.

[5] See Abdr. d. Zeitsch. deut. geol. Gesellschaft, 1874, p. 743.

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their relationship to North American forms, I can not do better than to quote from Dr. C. A. White:[1]

It has already been shown that the living Unionidæ of all Europe depart comparatively little from the primary, typical, oval form, and smooth or plain surface. These are the characteristics, so far as I am aware, of all the fossil species, save one, that are found in the strata of western Europe, including those from the Wealden and Cretaceous rocks. The exception referred to is *Unio toulouzanii*, Matheron, from the Lignite strata of the department of the mouths of the Rhone, which, while differing but little in form from the other fossil and living Unionidæ of western Europe, is marked by small plications upon its postero-dorsal surface. In Slavonia, Croatia, Dalmatia, and other parts of southeastern Europe, however, the fossil Tertiary species of *Unio* are much more numerous than the living species of the family are in the whole continent. Furthermore a large proportion of the types of these fossil species of southeastern Europe are as distinctively "North American" in character as those are which now live in the Mississippi River and its tributaries.

From these facts the inference seems to be a natural one that the living Unionidæ of all Europe are descended from those which are represented by the Mesozoic and Cenozoic fossil species of the western part of that continent; while the line of descent of the fossil species of southeastern Europe has evidently been cut off by disastrous changes of the physical conditions necessary for its perpetuity. The fact that these last-mentioned fossil species are identical in type with those of North America presumably indicates, though it does not necessarily prove, a community of origin; in which case they must have reached their present separated regions by some ancient continental connection now destroyed.

Among the Pliocene Unios from Slavonia there are many which almost absolutely agree with species living in the United States, belonging to the groups of *U. clavus*, *U. trigonus*, *U. perplexus*, *U. pustulosus*, and other well-known Mississippi Valley assemblages; and *U. sibinensis*, Tenecke, is almost exactly like *U. houstonensis*, Lea, of Texas; *U. neumayri*, Tenecke, is the counterpart of *U. modicus*, Lea, of Alabama; *U. stolitzkai*, Neumayr, is a nearly perfect reproduction of *U. æsopus*, Green, from the Ohio River, and *U. novskalensis*, Tenecke, is like a slightly roughened *U. pyramidatus*, Lea, from the same stream. Other species from the Pliocene beds of Slavonia almost as closely resemble *U. leai*, Gray, and *U. osbecki*, Lea, of China.

It seems not unreasonable, no matter where these striking types of Unios and Anodontas may have originated, whether in North America or the Old World, that they afterwards spread so that they occupied the greater part of Asia, Europe, except its western part, and possibly Africa, whose Unione fauna is, by the characters of the shells, apparently closely related to the Tertiary fauna of Europe, and that of India at the present time. It may be that the extreme cold of the glaciers exterminated or drove these forms to the region south of the Himalayas in Asia, and that the simple and probably more hardy species of western Europe spread rapidly to the eastward and southward after the Glacial epoch until they peopled the vast Palearctic region. But it seems probable that the European and northern Asiatic Anodontas, whose descendants now inhabit North America west of the Rocky Mountains, crossed over during the late Tertiary, as some of the forms now found

[1] Bull. U. S. Geol. Surv., III, Art. 23, p. 621, 1877.

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in the latter region have inhabited it long enough to change specifically from their oriental ancestors.

J. G. Cooper believes that he found a form of *Anodonta nuttaliana*, Lea, one of the *Cygnea* group, in the Pliocene beds of Kettleman Lake, California,[1] and in other localities, but these formations may be of more recent date.

It is probable that *Unio* (*Margaritana*) *margaritiferus*, Linnæus, is the type of a group which for a long time has been distributed around the boreal regions, as it seems to be very closely related to a number of widely scattered forms.

The theory of a comparatively recent land connection between northern Asia and North America is further confirmed by the fact that some fifteen species of land snails, and about five or six more fresh-water forms, are common to the entire boreal regions of the globe; and Dr. Asa Gray has shown[2] that there are very many species of plants belonging to China and Japan which are identical with those found in eastern North America, and for others there are exceedingly close representative species in the New World.

The Unione faunas of the Australian and Neotropical regions may be considered together, as they are evidently closely related. The theory of an antarctic land connection between these regions is not at all a new one, and recently Mr. Charles Hedley, in a paper on "The faunal regions of Australia,"[3] brings forward some strong arguments in favor of such a connection, as he believes it necessary in order to explain certain relationships between the life of the two regions. The Mutelid fauna of South America is also, no doubt, related more closely to that of Africa than to anything else at present existing, and von Ihering[4] suggests a probable land connection between South America and Africa across the Atlantic during the Mesozoic, to account for its present distribution.

It does not seem to me that it is necessary to bring in any such immense and violent changes of land and sea to account for the presence either of the Mutelidæ in Africa and South America or the nearly related Unios in the Australian and Neotropical regions. It must be remembered that changes take place in the fresh-water mussels very slowly; that species are living to-day that scarcely differ from those found at the close of the Cretaceous or the beginning of the Tertiary periods; and that the relation between the Mutelidæ of Africa and South America is not a very close one, so that it is not necessary in either case to prove any recent mingling of these faunas, either by a land way or other means. I believe it is far more probable that the Unios of South America and the Australian region are the remnants of earlier types that may have had a wide distribution throughout the northern hemi-

[1] Proc. Cal. Acad. Sci., 2d ser., IV, part 1, p. 168.

[2] Address before Am. Assn. Adv. Sci., August, 1872, p. 10.

[3] Read at the Adelaide meeting of the Australasian Assn. Adv. Sci., September, 1893.

[4] Zool. Anzeiger, Nos. 380 and 381, p. 14, 1891, 1892.

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sphere. The presence of a species in what are probably Triassic strata in Texas, with strongly radial beak sculpture, a character now confined to the Unionids of the two areas in question, is evidence in this direction. The forms with variously sculptured beaks which bear the embryos in the outer gills may be a more recent, vigorous stock, and it is possible that they have taken possession of the lakes and streams of the northern hemisphere and driven these older types to the southward.

The same thing may be true with the Mutelidæ, whose northernmost limit in the Old World is the lower Nile, and in the New, southern Mexico. And if the Cretaceous fossil now known as *Spatha galloprovincialis*, Matheron, from the mouths of the Rhone, is really a member of that genus, it would give color to this theory, which necessitates no violent changes of land and sea to account for present Naiad distribution.

To briefly sum up: The old arrangement of the families Mutelidæ and Unionidæ based upon the presence of siphons in the former and their absence in the latter can not stand, as this character may be developed or wanting in a single genus or even species. Ihering's redefinition of the families, in which the former is founded on the fact that the embryo is a three-parted *lasidium*, and that of the latter a *glochidium*, with the animal inclosed in a bivalve shell, agrees essentially with the characters of the hinge and shell generally. Those forms which would seem to belong to the Mutelidæ have irregularly taxodont teeth or vestiges of them, while the Unionidæ have schizodont teeth, which are arranged as cardinals or laterals, or both, though they may be merely rudimentary or even sometimes absent. The Naiades seem to be capable of being grouped into assemblages of related forms which have a more immediate common ancestry, and on the basis of this grouping we find them distributed into eight provinces, four of which are in the Old World and essentially agree with the regions of animal life of Wallace and Sclater.

These may be tabulated as follows:

AREAS OF THE NAIAD REGIONS.[1]

Palearctic	Europe. Northern and western Asia. North Africa to the Desert. Pacific drainage of North America.
Ethiopian	Africa south of the Sahara.
Oriental	Asia south of the Himalayas. East Indies to the Solomon Islands.
Australian	Australia. Tasmania. New Zealand.
Neotropical	South America.
Central American	Central America. Mexico east of the Cordillera. Cuba.
Mississippian	Entire Mississippi Valley and the Gulf drainage from west Florida to the Rio Grande. Mackenzie River system. Red River of the North. Great Lakes.
Atlantic	Lower St. Lawrence and rivers of eastern Canada. Atlantic drainage of the United States.

[1] For map of Naiad Regions see Plate IX.

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The Unios undoubtedly date back well into the Jurassic; probably into the Triassic. The post-Cretaceous *Unio* fauna of the Northwestern States is evidently closely related to the fauna of the Mississippi Valley, and this seems to be related to that of Mexico, to the oriental fauna, and more distantly to that of tropical Africa, as well as to the Tertiary forms of eastern Europe and Siberia. The Unios of Australia and South America are apparently closely related to those of the Australian region. There seems to be, too, a general relationship between the Mutelidæ of Africa and South America. These Mutelids and the Unios which bear the embryos in the inner gills have perhaps formerly occupied extensive areas in the northern hemisphere, and may have been supplanted by more modern forms.

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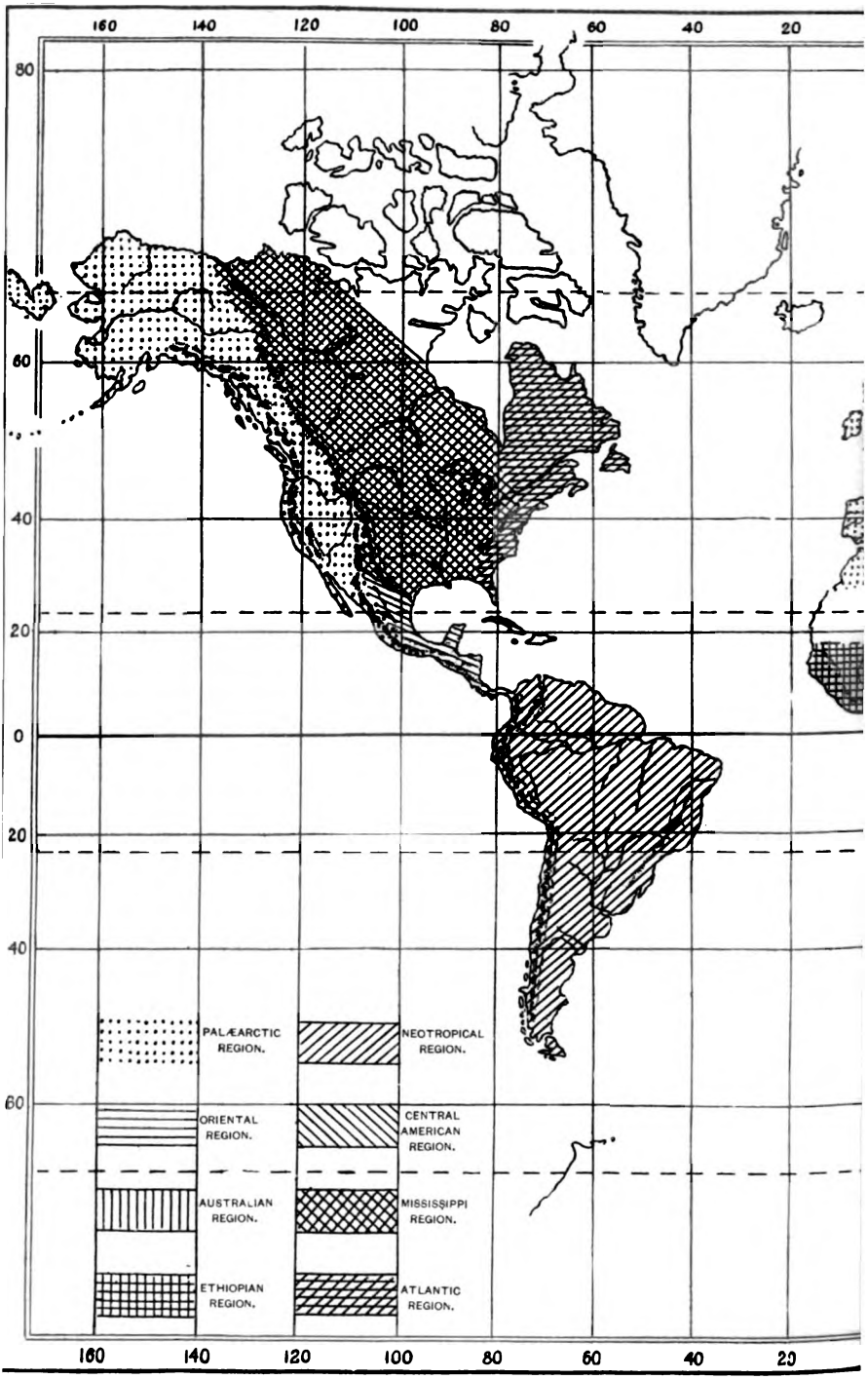

MAP SHOWING THE DISTRIBUTION

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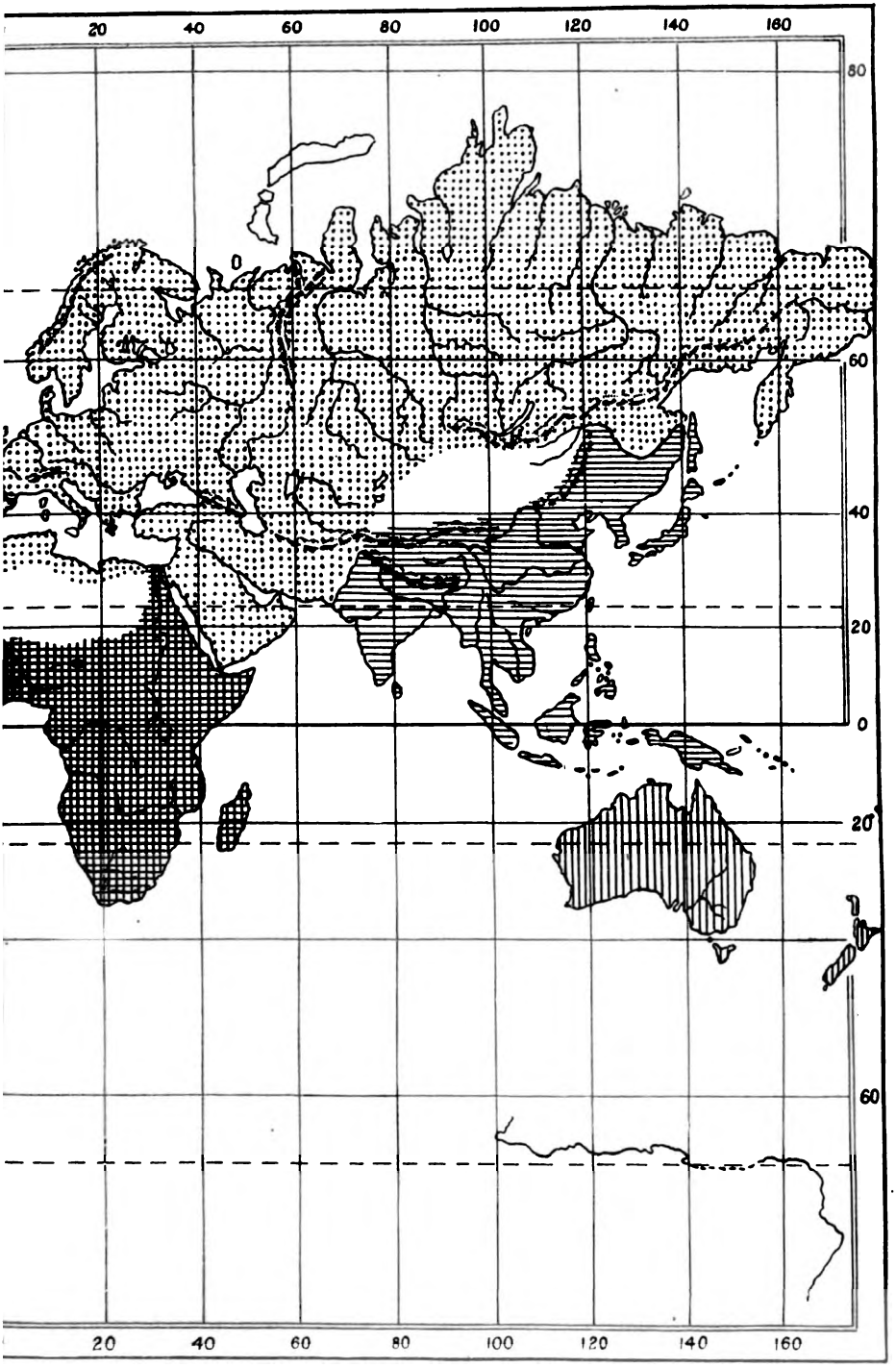

F PEARLY FRESH-WATER MUSSELS

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NOTE ON THE OCCURRENCE OF AN ARMADILLO OF THE GENUS XENURUS IN HONDURAS.

By FREDERICK W. TRUE,

Curator of the Department of Mammals.

ABOUT four years ago the National Museum received from Chamelicon, Honduras, with other mammals, an armadillo of the genus *Xenurus*. This is the first instance, so far as I am aware, in which any representative of this genus has been found in Central America. The species is presumably the *X. hispidus* of Burmeister, but to this I will refer again presently.

The specimen (No. 19464, U.S.N.M.) is a female, and was obtained at Chamelicon, Honduras, January 8, 1891. Mr. Wittkügel, the collector, states that the native name of the species is "Tumbo." He gives the following dimensions:

Total length, 1 foot 5 inches; tail, 6½ inches; hind foot, 4 inches.[1] The skin, from which the skull was extracted, has been mounted, and I have measured it, with the following result: Total length, along curves, 510 mm.; head and body, 362 mm.; head, 73.5 mm.; tail, 150 mm.; ear from crown, 27 mm.; hind foot and claw, 66.5 mm.; longest claw of fore foot (straight), 38.5 mm.

As but few specimens of the smaller *Xenuri* have been examined, I will describe this individual (Plate X) somewhat in detail. The head is short and blunt, and the extremity of the snout entirely naked for a distance of 16 mm. The cephalic shield consists of about 38 comparatively large plates. There are two short rows of plates in front of the scapular shield, of which the first contains 6 plates and the second 8 plates. The scapular shield consists of 8 antero-posterior rows of plates, including an anterior, narrow, marginal row, and the posterior row which resembles a thoracic ring. These rings are 11 in number, each with from 28 to 31 plates. The pelvic shield has 10 antero-posterior rows of plates.

The plates of the scapular and pelvic shields are large and quadrate, with rounded edges; those of the thoracic rings are rectangular, with

[1] This is probably a measurement of the hind *leg*. The foot with claw measures 2⅝ inches.

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straight edges. The marginal plates are smaller than the others and rounded. Between each pair of plates on the thoracic rings one hair only is exserted.

The ears are margined with a row of small rounded scales, but otherwise are entirely naked. The feet and outer sides of the legs are covered with somewhat scattered, flat, orbicular scales. The tail has similar flat scales, about 1.5 mm. in diameter, embedded in the skin at regular intervals. From the posterior margin of each scale one hair is exserted. The terminal portion of the tail for about 40 mm. is entirely naked on the upper side.

On the belly the hairs are in tufts, which are arranged in regular transverse rows. There are about twenty of these rows between the insertion of the fore and hind legs.

The relative size and length of the claws is the same as in the large species, *X. unicinctus*.

The skull (Plate XI) indicates that the individual is rather young. The nasals are narrowest in the middle, and expanded at the anterior end and also behind. Their posterior terminations are oblique, the frontal extending forward in an angle between them. The frontal itself is greatly swollen and the interorbital constriction is pronounced. The supraoccipital is flat. The posterior half of the jugal is much broader than in *X. unicinctus*, and its lower margin turns up sharply to meet the squamosal, making nearly a right angle with the anterior half. The basioccipital is narrow between the tympanic bullæ. The palate is short, its length behind the tooth row in the median line not more than that of the last two dental alveolæ and half of the third, while in *X. unicinctus* it extends backward a distance greater than the length of the last four dental alveolæ.

The lower border of the mandible is not concave posteriorly. The coronoid process is small, but well formed and somewhat curved. The condyle is concave.

Dental formula, $\frac{3}{3}$.

Dimensions of the skull.

Measurements.	38383, female.	Measurements.	38383, female.
	mm.		mm.
Length from upper margin of foramen magnum to end of nasals	80	Breadth of nasals at anterior extremity	10.5
Greatest zygomatic breadth	41	Breadth of nasals at posterior extremity	9.5
Mastoid breadth	38	Length of palate	46
Length of nasals in median line	23	Length of tooth row	28
Interorbital constriction	26	Length from last tooth to end of pterygoid	14

I have little hesitancy in referring this Honduras specimen to the *Dasypus* [*Xenurus*] *hispidus* of Burmeister,[1] although his types came from Lagoa Santa, Brazil. It agrees thoroughly both in size and in details of structure, except that the nasal bones appear to be somewhat

[1] Syst. Übersicht Thiere Brasil., 1. Theil, 1854, p. 287.

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different in shape. There is considerable variation in this latter feature in other armadillos.

In 1873 Gray published figures of two skulls similar to that of the Honduras specimen.[1] For one of these he established the species *Xenurus latirostris*, and for the other a new genus, *Ziphila*, with *Z. lugubris* as a new species.

Judging from the figures alone (for the descriptions are to some extent self-contradictory), the skulls represent closely allied, if not the same, species. The figures are presumably of natural size, though it is not so stated. If such is the case, the skull of *Z. lugubris* is somewhat larger than the Honduras specimen, but practically identical in form The former differs in that it has a somewhat thicker muzzle and less elevated frontal sinus. In the skull of *X. latirostris* the muzzle is shorter and broader still, and the frontal sinus is also still less elevated.

In view of the large amount of individual and age variation which the armadillos present, it is perhaps reasonable to suppose that the skulls of both *X. latirostris* and *Ziphila lugubris*, together with that of the Honduras specimen, are specifically identical with *X. hispidus*. It is not possible to demonstrate this, however, with the material now available, and the present paper is intended rather as a contribution toward the solution of that question. Its prime object is to record the presence of the genus *Xenurus* in Central America.

[1] Hand-list of Edentates, 1873, pp. 22, 23, pl. 7, figs. 1-4.

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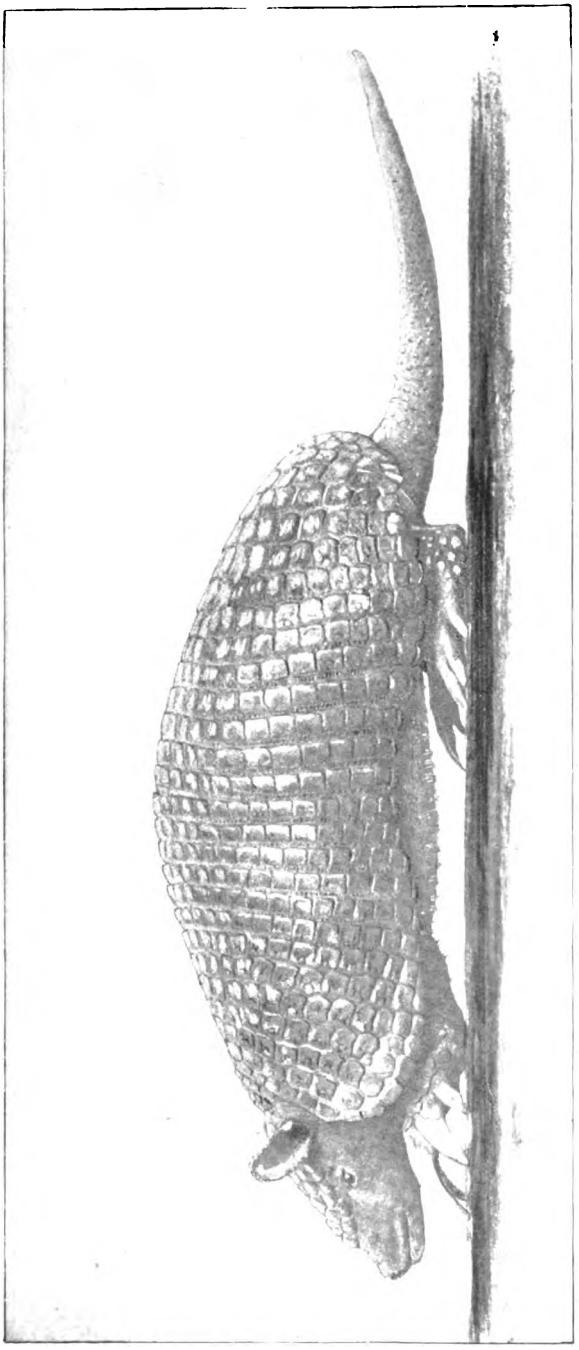

TUMBO ARMADILLO, FEMALE
Xenurus hispidus, Burmeister
(No. 19464, U. S. N. M.)

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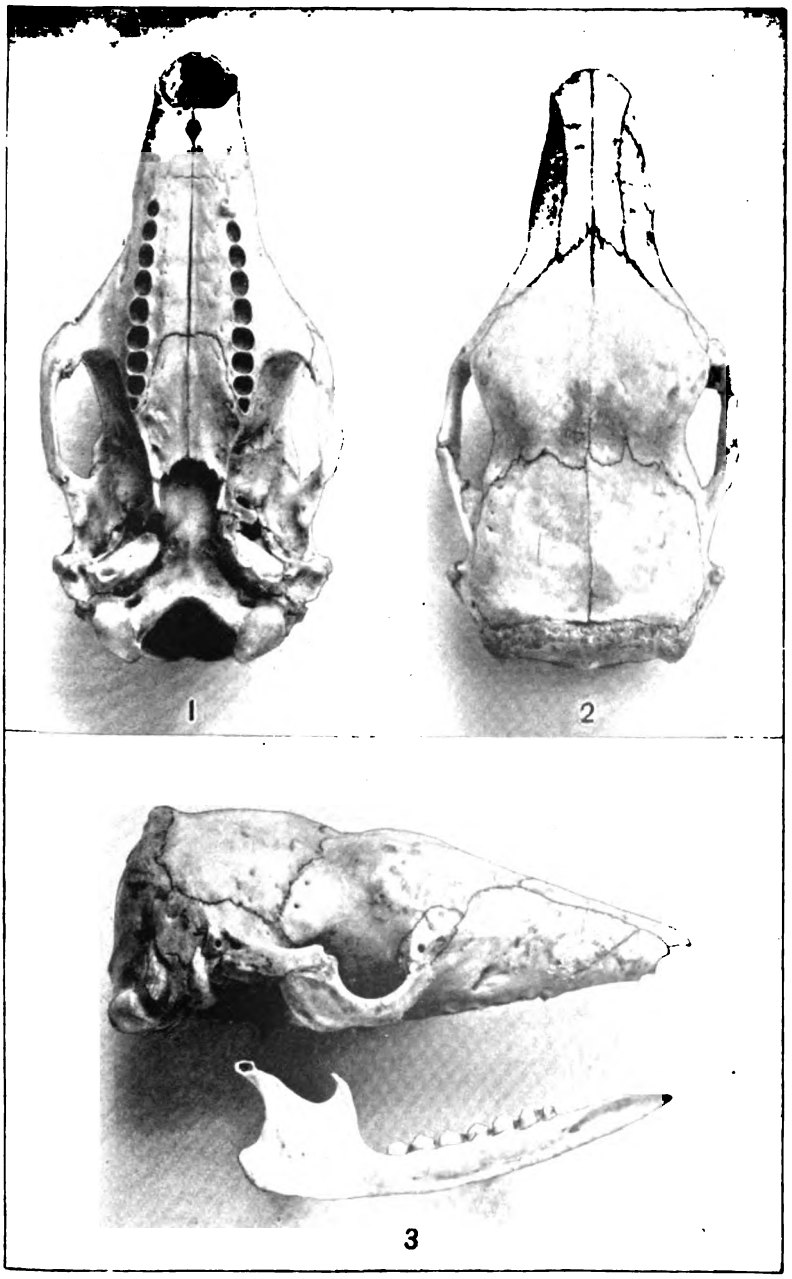

SKULL OF XENURUS HISPIDUS, Burmeister
(No. 35382, U. S. N. M.)

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THE GENUS CALLINECTES.

By MARY J. RATHBUN,

Second Assistant Curator, Department of Marine Invertebrates.

THE GENUS *Callinectes* was formed by Stimpson in 1860[1] for the reception of the species of Portunidæ having a narrow or ⊥-shaped abdomen in the male, and the merus of the outer maxillipeds short, sharply prominent, and curved outward at its antero-external angle. In this genus he places "the common American *Lupa diacantha*" (Latreille), and for want of sufficient material is unable to find constant differences between the northern and southern varieties of this species, or even to separate Pacific Coast specimens, regarding as doubtfully distinct *L. bellicosa*, which he had recently described from Guaymas.

In 1863 Lieut. Albert Ordway[2] published comparative descriptions of nine different species of *Callinectes*.[3] Say's name *hastatus* was given to the common species of eastern North America, the name *diacanthus* was restricted to a Brazilian form described by Dana in 1852, and six new species were added. Mr. Ordway claimed that there were well-marked characters separating the species, the variations in the abdominal appendages of the male being of primary importance.

In 1869 Prof. S. I. Smith gave the name *C. danæ* to Dana's *C. diacanthus*.

A. Milne-Edwards in his revision of the Portunidæ[4] did not recognize the validity of the genus *Callinectes*, but later[5] he considered it as distinct and placed in it *Lupa diacantha* (Latreille), the one species embracing all the *Callinectes* of America and West Africa. The species described by Say, Stimpson, Smith and Ordway, were recognized simply as varieties or races, the characters separating them being considered of trivial importance and not constant. To these varieties or races he added five others, three of which were made on slight characters.

[1] Ann. Lyc. Nat. Hist. N. Y., VII, p. 220.

[2] Afterwards Brig. Gen. Albert Ordway of volunteers.

[3] Boston Journ. Nat. Hist., VII, pp. 568–579.

[4] Arch. Mus. Hist. Nat. Paris, X, Addenda, 1861.

[5] Crustacés de la Région Mexicaine, 222, 1879.

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In 1879 Kingsley described a species, *C. dubia*, from the west coast of Nicaragua. In 1893 Mr. James E. Benedict added *Callinectes tumidus*, var. *gladiator*, from the west coast of Africa.

I have reduced the number of the above species by two, the *C. pleuriticus* of Ordway and *C. dubia* of Kingsley being based on young specimens of *C. arcuatus*. I have changed the name *Callinectes hastatus* to *Callinectes sapidus* and have added a new subspecies, *C. sapidus acutidens*.

De Geer[1] was perhaps the first naturalist to represent a *Callinectes*. Under the name "Crabe de l'ocean," he described in very general terms a swimming crab which he supposed identical with *Cancer pelagicus* of Linnæus, but which Ordway considered synonymous with Gibbes' *Lupa sayi*. Figures 8, 9 and 11 correctly represent neither of these species, nor are they applicable to any species of *Callinectes*, while, on the other hand, Figure 10 shows the narrow abdomen characteristic of that genus.

Bosc[2] describes the habits of the common edible crab and the methods of taking it; but calls it[3] by the name of another species, *Portunus hastatus*, translating a description given by Fabricius instead of describing the specimens he has seen.

Say was the first to give an unmistakable description of our northern *Callinectes*, calling it *Lupa hastata*, thereby confusing it with the Linnæan *Cancer hastatus*, a different species of *Lupa*, from the Mediterranean. That he undoubtedly meant to redescribe the known species is evidenced by the phrase, "In addition to the particulars already stated by naturalists of its manners." Say also redescribed *Lupa pelagica* (Linnæus), but the name of his form of that species was soon changed by Gibbes to *Lupa sayi*. It is evident that in like manner the specific name *hastata* should be retained solely for the Linnæan form. It does not alter the case that the European and American species are now placed in different genera.

After Say, Latreille was the only writer to give a name to our species. In 1825[4] he described *Portunus diacantha*, but unfortunately confused several species under this name. As the variety he mentions as having been sent from Philadelphia, in which "les quatre dents du front sont réunies et ne forment qu'un lobe largement échancré," is undoubtedly our common *Callinectes*, his typical form must be a different species. The terms "flavescente, maculis rubris, elongatis" and "un verdâtre-obscur en devant" are strongly suggestive of the southern *Callinectes bocourti*. In any case, the name *diacanthus* is not available for the common northern form.

Besides the collection in the United States National Museum, I have been permitted, through the kindness of Dr. Walter Faxon and Prof.

[1] Mémoires pour servir a l'Histoire des Insectes, VII, 427, pl. XXVI, figs. 8-11, 1778.
[2] Hist. Nat. Crust., I, pp. 212-214, 1801-1802.
[3] Page 219.
[4] Encyc. Méth. Hist. Nat., Entom., X, 190.

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S. I. Smith, to examine a number of specimens in the Museum of Comparative Zoology of Harvard University and the Peabody Museum of Yale University. I am indebted to Prof. C. C. Nutting for permission to notice a specimen of *C. danæ* from Cuba, collected by the Bahama expedition of the State University of Iowa in 1893, and owned by that institution. The approximate number of specimens of each spe ies examined is as follows:

Specimens of Callinectes examined.

Name of species.	Number of specimens.	Name of species.	Number of specimens.
C. sapidus	300	*C. bocourti*	20
C. ornatus	200	*C. toxotes*	30
C. danæ	100	*C. bellicosus*	70
C. arcuatus	70		
C. larvatus	100	Total	910
C. tumidus	20		

Only in working over a large amount of material is it possible to judge whether the characters separating nearly related forms are invariably coexistent, or whether they are modifications dependent on environment, or simply individual variations. In the present case I have been able to verify Ordway's classification, which was necessarily based on a limited number of individuals.

The value of the differentiation of the generative organs in determining species, has for some time been recognized. It is well exemplified in *Callinectes*. In *C. sapidus*, our common edible species, and the only species north of Cape Hatteras, the appendages of the first abdominal segment in the male reach as far as the tip of the last segment. This is also the case in *C. bocourti*, of the tropical Atlantic, and *C. toxotes* from the Pacific. In *C. arcuatus* and *C. bellicosus* of the west coast, they reach or nearly reach the terminal segment, but not the extremity; while in *C. ornatus*, *C. danæ* and *C. tumidus*, they stop at the middle of the penultimate segment, and in *C. tumidus* are curved at the tips. In *C. larvatus* the appendages are noticeably short, reaching slightly beyond the proximal end of the penultimate segment.[1]

These variations in the length and form of the appendages are accompanied by other differences, such as the shape and sculpture of the carapace, the outline of the front and lateral teeth, the length of the lateral spine, the granulation of the chelipeds, and the form of the abdomen in both sexes. These differences are specific. In species where the appendages are similar in length and position, no confusion need arise, owing to the other widely different characters possessed by

[1]Brocchi (Ann. Sci. Nat., Zool., (6) II, 1875) claims to have examined a large number of specimens of "*Neptunus diacanthus*" from widely different localities, and finds only two distinct forms of appendages, long and short, which are coincident with only one other character, the outline of the front. He suggests the formation of two species based on these characters.

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these species. *C. bocourti*, with its front of four rounded lobes and long narrow intramedial region, could not be confounded with *C. sapidus;* while the unusually wide intramedial region of *C. ornatus* will serve to distinguish it from any other species yet known. A little practice in observing the peculiarities of the carapace will enable one to determine with ease the species of young individuals down to at least one inch in width.

ANALYTICAL KEY TO THE SPECIES OF CALLINECTES EXAMINED.

A. Inner supraorbital fissure closed.
  B. Frontal teeth two ..... *sapidus* (p. 352).
  B′. Frontal teeth four.
    C. Appendages of first abdominal segment of male much shorter than the abdomen.
      D. Lateral spine more than twice the length of preceding tooth.
        E. Intramedial region broad, its anterior width about three times its length ..... *ornatus* (p. 356).
        E′. Intramedial region narrow, its anterior width about twice its length.
          F. Appendages of first abdominal segment of male greatly exceeding the third segment.
            G. Appendages with tips straight. Second to sixth antero-lateral teeth equilateral ..... *danæ* (p. 357).
            G′. Appendages with tips curved. Antero-lateral teeth with posterior margins longer than anterior ..... *arcuatus* (p. 362).
          F′. Appendages exceeding the third segment but little, or not at all. *larvatus* (p. 358).
      D′. Lateral spine less than twice the length of preceding tooth. *tumidus* (p. 359).
    C′. Appendages reaching the extremity of abdomen, or nearly so.
      D. Antero-lateral region granulate. Lateral spine between two and three times length of preceding tooth ..... *toxotes* (p. 363).
      D′. Antero-lateral region smooth. Lateral spine less than twice preceding tooth ..... *bocourti* (p. 360).
A′. Inner supraorbital fissure open ..... *bellicosus* (p. 365).

CALLINECTES SAPIDUS, new name.

(Plates XII; XXIV, fig. 1; XXV, fig. 1; XXVI, fig. 1; XXVII, fig. 1.)

Lupa hastata, SAY, Journ. Acad. Nat. Sci. Phila., I, pp. 65, 443, 1817 (not *L. hastata*, DESMAREST, 1823, nor MILNE-EDWARDS, 1834).

Lupa dicantha, DE KAY, Nat. Hist. N. Y., Zool., Part VI, Crust., p. 10, pl. III, fig. 3, 1844.

Callinectes hastatus, ORDWAY, Boston Journ. Nat. Hist., VII, p. 568, 1863.—SMITH, Rept. U. S. Commr. Fish and Fisheries, 1871-1872, p. 548 (1874).

Callinectes hastatus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 224, 1879 (variety of *Callinectes diacanthus*).

Adult.—Carapace moderately convex. Granules of medium size, crowded on the inner branchial and cardiac regions, scattered and faintly marked on the anterior half of the carapace. The length of the

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intramedial region is about one-half its anterior width.[1] The frontal or interantennal teeth are two, triangular, acute, with faint indications of two others on their oblique inner margins (Plate XXIV, fig. 1). The median subfrontal spine is conical and strong. The inner supraorbital tooth is broad and bilobed, the lobes obtuse, the outermost very prominent. The adjoining fissure is closed except at the anterior extremity, where there is a shallow V-shaped opening. The lateral teeth are concave on both margins and acuminate. Lateral spine in males from three to about four times the length of the preceding tooth.[2] Inner suborbital tooth acute. Penultimate segment of abdomen of male (Plate XXV, fig. 1) much constricted in its proximal half, widening at both extremities. Terminal segment obtuse, lateral margins convex proximally, slightly concave or straight distally. Appendages of first segment[3] (Plate XXVI, fig. 1) reaching nearly to or beyond the extremity of the abdomen, near together for their proximal half, with only a slight outward curve; distal portions widely divergent except at tips. The abdomen of the adult female (Plate XXVII, fig. 1) is very broad, the margins of the last three segments separately convex; terminal segment longer than wide. Costæ of carpus and manus with depressed granules or often almost smooth to the eye.

Medium-sized specimens.—Carapace narrower than in adults; granules more distinct, especially on the anterior half. Frontal teeth less acute. Antero-lateral teeth broader, their margins more or less convex. Lateral spine a little more than twice the length of preceding tooth. Inner suborbital tooth broader, obtuse. Costæ of carpus and manus more distinctly granulate.

In very young males the abdominal appendages are much shorter, reaching only to the middle of the penultimate segment.

Size.—Adult males vary in width from 6¼ to 7⅜ inches; adult females from 5 to 7 inches.

[1]The transverse dimension of the intramedial region, or that division of the gastric region posterior to the second granulate ridge, I have designated as its width. Ordway does so under *C. toxotes*, but uses the opposite term under *C. ornatus*. Thus the intramedial region of both he describes as long and narrow, which is misleading, the two species being entirely different in this respect.

[2]Measurements are made from the tips of the spine and tooth to the inner end of the intervening sinus; thus the spine is measured on its anterior margin, the tooth on its posterior margin.

[3]In both sexes of *Callinectes* the first abdominal segment is almost entirely concealed beneath the carapace; thus the abdomen in the male consists of five segments, the third, fourth and fifth normal segments being coalesced, the first and second being furnished with appendages. In the female there are seven segments, the second, third, fourth, and fifth with appendages. In Plates XXV and XXVII the first two segments are not shown.

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Measurements of Callinectes sapidus.[1]

Catalogue number.	Sex.	Length.	Width.	Length of lateral spine.	Length of posterior lateral tooth.
		mm.	*mm.*	*mm.*	*mm.*
4946	Male	79	185	18	6.5
5280	Female	64	176	28	6.8
17976	Female	54	124	12.2	5.2

Locality.—Callinectes sapidus is common in bays and at the mouths of rivers from Cape Cod to Texas, and is especially abundant in Chesapeake Bay. Beyond these limits it is of rare occurrence. It is found occasionally in Massachusetts Bay,[2] and a single individual is recorded from the Millpond, an inlet of Salem Harbor.[3] Three specimens in the National Museum are from brackish water at Sing Sing, New York, collected by Prof. S. F. Baird. The following localities from which specimens have been examined are also worthy of notice:

Jamaica: U. S. Fish Commission (No. 7679, U. S. N. M.); Kingston Harbor (No. 17976, U. S. N. M.), Dr. R. P. Bigelow; mouth of Rio Cobre, fresh water (No. 18244, U. S. N. M.), Dr. R. P. Bigelow.

Bermudas: Bickmore (Mus. Comp. Zool.).

Brazil: Rio Grande; Capt. Harrington, June, 1861 (Mus. Comp. Zool.).

A fossil *Callinectes* (Plate XXVIII) was picked up on Gaugatha Beach, Accomac County, Virginia, September, 1894, by Mr. James P. Lucas, of Baltimore. It may have come from the extensive Miocene beds along that coast. The outline of the carapace is not preserved. The ventral surface indicates that the species is very near, if not identical with, *C. sapidus*, although the penultimate segment of the abdomen is narrower than is commonly seen in that species, and the median groove of the sternum is deeper and longer.

Southern specimens of *C. sapidus* show a tendency to develop sharper teeth or spines. This deviation culminates in two lots of specimens from Brazil, which I designate as a subspecies.

CALLINECTES SAPIDUS ACUTIDENS, new subspecies.

(Plates XIII; XXIV, fig 2.)

In this subspecies the carapace is wider and all the prominences are more strongly marked than in the typical *C. sapidus*. The areolations are separated by deeper depressions, the granules are more raised, the gastric ridges are stronger and more sinuous. There is a transverse granulate ridge on the cardiac lobes. The frontal teeth are narrower and more acute, and there are two small intervening teeth (Plate XXIV, fig. 2). Subfrontal and suborbital spines acuminate. Lateral teeth broad at base, narrowing abruptly to long, acuminate tips; margins

[1] The length is measured from the median sinus of the front.

[2] Smith, Rept. U. S. Commr. Fish and Fisheries, 1871–1872, p. 548 (1874).

[3] C. Cooke, Amer. Nat., I, p. 52, 1867.

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granulate. Last two teeth very long, adding to the effect of width, and making the antero-lateral margin less arcuate. Lateral spine very long, much longer than in *C. sapidus* of equal size, more than three times the length of the preceding tooth. Abdomen as in the species. Costæ of cheliped very prominent and strongly granulate. The granules of the inner margin of the merus extend upon the upper surface of the distal half. There are two carpal spines, one at the outer angle and a shorter one close to the propodal spine.

Size.—Length to sinus, 49 mm.; total length, 50.8; width, 121; length of lateral spine, 16; of preceding tooth, 5.

Type locality.—Santa Cruz, Brazil; Thayer expedition (Mus. Comp. Zool.); 1 male.

Two smaller males from Rio de Janeiro, Thayer expedition (Mus. Comp. Zool., and No. 19083, U.S.N.M.), resemble the type. The frontal and antero-lateral teeth are less acuminate, but the areolations are as strong and the lateral spine equally long.

In Nicaragua Mr. Charles W. Richmond collected a series of specimens which are intermediate between *C. sapidus* and typical *C. sapidus acutidens*. In the largest specimen, a male (Plate XIV) from Escondido River, September 6, 1892 (No. 18630, U. S. N. M.), the proportion of the carapace is as in typical *C. sapidus*. The areolation and granulation of the front are as in *C. sapidus acutidens*. The antero-lateral teeth are very acuminate, but not so slender as in *C. sapidus acutidens*, and the last two teeth are not so long. The lateral spine is less than three times the length of the preceding tooth, and slopes backward. The carpus has a spine close to that on the manus. The upper surface of the manus has not the conspicuous granulation of typical *C. sapidus acutidens*, although granules can be seen with the lens. A lot of four medium-sized specimens (1 male and 3 females, No. 18246, U. S. N. M.) were obtained at Greytown. In these the areolation and granulation are as in No. 18630, the frontal and lateral teeth are less sharp, the spine is much shorter, as in the young of typical *C. sapidus*, and is directed forward. In the Museum of Comparative Zoology there are three males of medium size, without locality, which resemble those from Greytown.

Size of male (No. 18630, U.S.N.M.).—Length to sinus, 53.5 mm.; total length, 56; width, 126; length of lateral spine, 14.3; of preceding tooth, 5.

Were the differences between the Brazilian and the Central American forms to prove constant in a large series of specimens, it might be best to call the latter by a different name.

Besides the subspecies, the only specimen of *C. sapidus* from Brazil that I have seen is a large and old male in the Museum of Comparative Zoology, labeled "Rio Grande, Brazil; Capt. Harrington, June, 1861." This specimen is very near the typical *C. sapidus*, although the lateral spine is directed backward and the frontal teeth are somewhat concave on their outer side.

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CALLINECTES ORNATUS, Ordway.

(Plates XV; XXIV, fig. 3; XXV, fig. 2; XXVI, fig. 2; XXVII, fig. 2.)

Callinectes ornatus, ORDWAY, Boston Journ. Nat. Hist., VII, p. 571, 1863.—SMITH, Trans. Conn. Acad. Sci., II, p. 8, 1869.

Callinectes ornatus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 225, 1879 (variety of *Callinectes diacanthus*).

Carapace more convex than in *C. sapidus;* depressions shallow; length of intramedial area much less than half its anterior width. Surface finely and more evenly granulated than in *C. sapidus.* Frontal teeth four; the two outer obtuse, margins slightly concave; inner teeth small (Plate XXIV, fig. 3). Subfrontal tooth a prominent spine. Suborbital tooth a broad arcuate lobe. Lateral teeth shallow and broad; margins convex at base, concave in the terminal half; posterior margins longer than anterior; tips acute in the first 5 or 6 teeth, acuminate in the remainder. Lateral spine about two and one-half times the preceding tooth, directed forward. Abdomen of male (Plate XXV, fig. 2) narrower than in *C. sapidus.* Penultimate segment widest at the proximal end; margins slightly concave. The appendages (Plate XXVI, fig. 2) reach midway of the length of the penultimate segment; proximally they curve inward and touch or overlap each other; the distal portions are straight and divergent. At about one millimeter from the extremity, the appendage widens a little and then narrows rather abruptly to the very slender tip. The abdomen of the female (Plate XXVII, fig. 2) is very broad at the proximal end and tapers more rapidly to the terminal segment than in any other species.

Size.—Adult males vary in width from $4\frac{3}{8}$ to $4\frac{3}{4}$ inches; adult females, from $3\frac{3}{4}$ to $4\frac{1}{4}$ inches.

Measurements of Callinectes ornatus.

Catalogue number.	Sex.	Length to sinus.	Total length.	Width.
		mm.	*mm.*	*mm.*
2076	Male	54	56	120
7584	Female	46.5	48	106

The localities of specimens examined are as follows:

South Carolina: East end Sullivan's Island oyster bed, Charleston; Joe Whiteside and C. C. Leslie (No. 3185, U. S. N. M.).

Bermudas: G. B. Goode (No. 3175, U. S. N. M.); Dr. F. V. Hamlin (No. 4028, U. S. N. M.).

Florida: Big Pine Key, H. Hemphill (No. 14889, U. S. N. M.); Key West, various collectors; Marco, H. Hemphill (No. 18231, U. S. N. M.); Punta Rassa, C. W. Ward (No. 5753, U. S. N. M.); Bird Key, schooner *Grampus* (No. 15246, U. S. N. M.).

Bahamas: Andros Island and Andros Bank, in sponges (F. A. Stearns collection).

Cozumel, shore in net; str. *Albatross* (No. 9557, U. S. N. M.).

Jamaica, Dr. Smith (No. 2448, U. S. N. M.); str. *Albatross* (No. 18227, U. S. N. M.)

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St. Thomas, A. H. Riise (No. 2457, U. S. N. M.).
Sabanilla, United States of Colombia; str. *Albatross* (No. 18228, U. S. N. M.).
Curaçao; str. *Albatross* (No. 7584, U. S. N. M.).
Cumana, Venezuela; Capt. Couthouy (Mus. Comp. Zool.).
Brazil: Maranhão, F. E. Sawyer (No. 18232, U. S. N. M.); Victoria, Hartt and Copeland, Thayer Expedition (Mus. Comp. Zool.).

Ordway records this species also from the Tortugas and Haiti.

Variations.—Brazilian specimens vary a little from typical specimens in the form of their antero-lateral teeth; the posterior margins instead of being concave are straight or slightly convex; the teeth, in consequence, do not appear so shallow. In other respects these specimens are typical *C. ornatus*.

CALLINECTES DANÆ, Smith.

(Plates XVI; XXIV, fig. 4; XXV, fig. 3; XXVI, fig. 3; XXVII, fig. 3.)

Lupa dicantha, DANA, Crust. U. S. Expl. Exped., I, p. 272, 1852, pl. XVI, fig. 7, 1855 (not *Lupea dicantha*, MILNE-EDWARDS, 1834).
Callinectes diacanthus, ORDWAY, Boston Journ. Nat. Hist., VII, p. 575, 1863.
Callinectes Danæ, SMITH, Trans. Conn. Acad. Sci., II, p. 7, 1869.
Callinectes diacanthus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 226, 1879 (variety of *Callinectes diacanthus*).

In general appearance resembles *C. ornatus*. The intramedial region is, however, much narrower. The front has two distinct median teeth, small and subacute; lateral teeth narrow, acute. The front resembles that of *C. ornatus*, but the median teeth are more prominent, the lateral teeth narrower (Plate XXIV, fig. 4). The teeth of the lateral margin are different from those of any other species with which it is associated. The second to the sixth inclusive do not trend forward as in *C. ornatus*, *C. larvatus*, and *C. tumidus*,—that is, the posterior margin of the teeth is not much longer or more convex than the anterior. The teeth are acute, the seventh and eighth especially so; the eighth tooth is directed forward. Lateral spine more than three times the length of the preceding tooth. Suborbital tooth rather long and narrow. Penultimate segment of male abdomen (Plate XXV, fig. 3) very broad at proximal end. The appendages (Plate XXVI, fig. 3) reach to the middle or beyond the middle of the penultimate segment. They sometimes touch each other proximally, but more often are separated. In length they approach those of *C. ornatus*, but in *C. danæ* the appendages taper regularly and do not widen near the tip. The abdomen of the female (Plate XXVII, fig. 3) is similar to that of *C. ornatus*, but wider in its fifth and sixth segments. Costæ of chelipeds very closely set with fine granules interspersed with larger ones. Very small specimens of this species can be separated from *C. ornatus* by the narrower intramedial region, and from *C. larvatus*, which they superficially resemble, by the outline of the lateral teeth and the longer spines.

Size.—The largest males are from 5 to 5¼ inches wide. The females are much smaller; the largest is 3¾ inches; one with eggs is 3⅝ inches

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wide. The dimensions of Dana's type in the National Museum (No. 2371) are: Length to sinus, 55.5; greatest length, 57.5; width, 131.5 mm. Length of Cuban specimen, to sinus, 54.5; greatest length, 56.3; width, 127 mm.

The localities of specimens examined are as follows:

Bahia Honda, Cuba, May 8, 1893; Bahama Expedition of the State University of Iowa.

Jamaica: str. *Albatross* (No. 18237, U. S. N. M.); Kingston Harbor, Dr. R. P. Bigelow (No. 17977, U. S. N. M.).

Old Providence; str. *Albatross* (No. 18238, U. S. N. M.).

Aspinwall; str. *Albatross* (18239, U. S. N. M.). Caught at night with a small hoop-net baited and set at a little distance from the steamer in four fathoms.

Sabanilla, United States of Colombia; str. *Albatross* (No. 7559, U. S. N. M.).

Brazil: Pernambuco, C. F. Hartt (Peabody Mus. Yale Univ.); Rio de Janeiro, U. S. Exploring Expedition, types of Dana's *Lupa dicantha*, 1 male (No. 2371, U. S. N. M.), 1 male (Mus. Comp. Zool.); Rio de Janeiro, Thayer Expedition (Mus. Comp. Zool.), very abundant; Santos, Thayer Expedition (Mus. Comp. Zool.).

Recorded by Smith from Bahia.

CALLINECTES LARVATUS, Ordway.

(Plates XVII; XXIV, fig. 5; XXV, fig. 4; XXVI, fig. 4; XXVII, fig. 4.)

? Neptunus marginatus, A. MILNE-EDWARDS, Arch. Mus. Hist. Nat. Paris, X, 318, pl. XXX, fig. 2, 1861.

Callinectes larvatus, ORDWAY, Boston Journ. Nat. Hist., VII, p. 573, 1863.—SMITH, Trans. Conn. Acad. Sci., II, p. 9, 1869.

Callinectes larvatus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 225, 1879 (variety of *Callinectes diacanthus*).

Callinectes larvatus, var. *africanus?*, BENEDICT, Proc. U. S. Nat. Mus., XVI, 1893, p. 537.

Areolations well marked; granules coarse; length of intramedial area a little less than one-half its anterior width. Front four-toothed (Plate XXIV, fig. 5); median teeth small, more prominent than in *C. ornatus;* lateral teeth obtuse, broader and more arcuate than in *C. ornatus.* Suborbital tooth prominent, arcuate, curved upward. Antero-lateral margin little arched. The teeth are well separated by deep rounded sinuses; the second to the fifth, inclusive, have convex posterior margins; the first three or four teeth are obtuse, the remainder sharp-pointed. Lateral spine between two and two and a half times the length of preceding tooth. Terminal portion of abdomen of male slender. Penultimate segment (Plate XXV, fig. 4) wider at proximal than at distal end, margins slightly concave. Appendages very short, overreaching the third segment but little or not at all (Plate XXVI, fig. 4). The abdomen of the female (Plate XXVII, fig. 4) is much narrower than in any other species; terminal segment much longer than wide. Costæ of manus prominent, with medium granules.

Size.—The width of full-grown males varies from 4¼ to 4¾ inches. The largest female is about 4 inches wide.

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Measurements of Callinectes larvatus.

Catalogue number.	Sex.	Length to sinus.	Entire length.	Width.
		mm.	*mm.*	*mm.*
2142	Male	52	54.3	120
2142	Female	44.3	46	102

The localities from which specimens have been examined are as follows:

Florida: Long Key (No. 14890, U. S. N. M.); near Indian Key (No. 14032, U. S. N. M.); Big Pine Key (No. 14892, U. S. N. M.); Key West, various collectors; Tortugas (Nos. 2097, 2142, U. S. N. M.).

Bahamas; New Providence, str. *Albatross* (No. 17948, U. S. N. M.).

San Domingo; W. M. Gabb (No. 4172, U. S. N. M.).

Jamaica: Cozumel; Old Providence; Sabanilla, United States of Colombia; Curaçao, str. *Albatross*.

St. Thomas; A. H. Riise (No. 2446, U. S. N. M.).

Brazil: Rio Grande do Norte, Thayer Expedition (Mus. Comp. Zool.); Rio Vermelho, Bahia, R. Rathbun, Hartt Explorations, 1875–77 (carapace of young specimen).

Porto Grande, St. Vincent, Cape Verde Islands; United States Eclipse Expedition, 1889, one young female without chelipeds.

Africa, United States Eclipse Expedition, 1889: Baya River, Elmina, Ashantee (No. 14878, U. S. N. M.); St. Paul de Loando (No. 14877, U. S. N. M.).

Recorded from Vera Cruz, Mexico, by A. Milne-Edwards.

Neptunus marginatus, A. Milne-Edwards, as Professor Smith has pointed out, was probably based on an immature female of a *Callinectes*. It is from "Côte du Gabon," West Africa.

CALLINECTES TUMIDUS, Ordway.

(Plates XVIII; XXIV, fig. 6; XXV, fig. 5; XXVI, fig. 5; XXVII, fig. 5.)

Callinectes tumidus, ORDWAY, Boston Journ. Nat. Hist., VII, p. 574, 1863.

Callinectes tumidus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 226, 1879 (variety of *Callinectes diacanthus*).

Carapace very convex; depressions deep; length of intramedial area no more than half its anterior width. Frontal teeth (Plate XXIV, fig. 6) four, triangular, tips rounded, the two median large and prominent, but not so far advanced as the lateral. Submedian tooth short, exceeding the front but little. Suborbital lobe rounded. Antero-lateral margin very arcuate. Lateral teeth broad, the first six very convex on their posterior margins and obtuse, the next two acute. Of the eight teeth, the fifth is the largest; the sixth and seventh are next in size. Lateral spine less than twice the length of the preceding tooth. Penultimate segment of male abdomen (Plate XXV, fig. 5) similar in shape to that of *C. ornatus*, but much shorter. Appendages (Plate XXVI, fig. 5) reaching to about the middle of the penultimate segment, the tips incurved. In the abdomen of the female (Plate XXVII, fig. 5) the penultimate segment is shorter than the fifth, and its margins are very arcuate. The spine at the distal end of the merus and the carpal spine are almost

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obsolete, being replaced by blunt prominences. There is a blunt tooth on the anterior margin of the carpus just below the inner angle. Costæ of manus coarsely and sparingly tuberculate. In specimens larger than the one photographed (Plate XVIII), the lateral spine is proportionally shorter and the chelipeds much heavier.

Size.—Adult males measure $4\frac{5}{8}$ and $4\frac{7}{8}$ inches in width, with a length of $2\frac{1}{2}$ inches. An adult female is $4\frac{1}{16}$ inches wide and 2 inches long.

Measurements of Callinectes tumidus.

Sex.	Locality.	Length to sinus.	Entire length.	Width.
		mm.	mm.	mm.
Male	Victoria	60.5	63	126
Male	Cannavieras	59.5	62	116
Female	Long Key	50.5	52.5	103

The localities where this species has been taken are as follows:

Florida: Long Key, H. Hemphill (No 14087, U. S. N. M.); Key West (Mus. Comp. Zool.); Tortugas, J. B. Holder (No. 2143, U. S. N. M.).

Jamaica; str. *Albatross* (No. 18236, U. S. N. M.).

Old Providence; str. *Albatross* (No. 7541, U. S. N. M.).

Brazil, Thayer Expedition (Mus. Comp. Zool.): Rio Grande do Norte; Victoria and Cannavieras, Hartt and Copeland.

Recorded from Haiti by Ordway.

CALLINECTES TUMIDUS GLADIATOR, Benedict.

Callinectes tumidus, var. *gladiator*, BENEDICT, Proc. U. S. Nat. Mus., XVI, 1893, p. 537.

Distinguished from *C. tumidus* by its longer lateral spine and less convex carapace. The abdominal appendages are curved as in typical *C. tumidus*, and the front and lateral teeth correspond to that species.

Type.—Small male from Beyah River, Elmina, Ashantee, Africa, U. S. Eclipse Expedition, 1889 (No. 14879, U.S.N.M.).

CALLINECTES (?) BOCOURTI, A. Milne-Edwards.[1]

(Plates XIX; XXIV, fig. 7; XXV, fig. 6; XXVI, fig. 6; XXVII, fig. 6.)

Callinectes bocourti, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 226, 1879 (variety of *Callinectes diacanthus*).

? Callinectes cayennensis, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 226, 1879 (variety of *Callinectes diacanthus*).

? Callinectes africanus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 229, 1879 (variety of *Callinectes diacanthus*).

[1]The brief description given by A. Milne-Edwards corresponds to the specimens which I have referred to this species. An individual labeled "*Callinectes bocourti*, A. M. Edwards, Belize, Honduras," recently received from the museum at Paris, is an undoubted *C. danæ*. I am loath, however, to make *C. bocourti* a synonym of *C. danæ* until I am assured that the specimen was correctly labeled, in which case the species here called *C. bocourti* must receive a new name.

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Very convex; areolations prominent; coarsely granulate except along the lateral margin, where the carapace is smooth. Intramedial region very long, its length about equal to its posterior width. Front (Plate XXIV, fig. 7) with four large rounded teeth, the median the smaller, and a little less advanced than the lateral, except in a few cases where they project as far as the lateral. Suborbital tooth short, triangular, narrow, obtuse. Antero-lateral teeth very broad, acute, the last two or three spiniform. Lateral spine short, usually less than twice the length of the preceding tooth. Penultimate segment of the abdomen in the male (Plate XXV, fig. 6) constricted in its proximal portion, widening at both extremities. Terminal segment long. Appendages (Plate XXVI, fig. 6) reaching to the end of the abdomen, with a double curve as in *C. sapidus*; tips crossing. The sternum has a deep longitudinal groove in front of the abdomen. The abdomen of the female (Plate XXVII, fig. 6) is very long, especially the penultimate segment; the terminal segment is much longer than wide. Costæ of chelipeds with depressed granules, often appearing almost smooth to the eye. The carpal and the anterior meral spine are usually normal, though sometimes in old specimens reduced to blunt projections. There is a broad blunt tooth on the anterior margin of the carpus just below the inner angle.

Size.—The largest male is 5½ inches wide; the largest female, 4⅞ inches.

Measurements of Callinectes bocourti.

Catalogue number.	Sex.	Length to sinus.	Entire length.	Width.	Spine.	Last tooth.
		mm.	*mm.*	*mm.*	*mm.*	*mm.*
18233	Male	56	57.5	114	9.5	5.2
18234	Male	69.5	72.5	140	10	7
Cannavieras (M. C. Z.)	Female	57.5	60	124	12 *a*	5 *a*

a Tip broken.

Color.—Alcoholic specimens indicate that the color is rich and variegated. In a large male from Sabanilla, the carapace is greenish, darker in the anterior half, and especially on the gastric region. The posterior half is yellowish-green, the yellow being most apparent on the inner half of the branchial region. There are four oblong red spots following the outline of the frontal and antero-lateral margin, but at a little distance from the teeth. There are blotches of red on the cardiac and branchial regions. The transverse lines of granules crossing the carapace are also red. The chelipeds are a purplish brown. In a large male from Greytown the central and antero-lateral portions are brown, the yellow branchial spots are brighter than in the preceding, and there is a tinge of blue along the posterior margin. Smaller specimens are duller in color, but all show traces of red and yellow spots.

The specimens examined are from the following localities:

Greytown, Nicaragua; C. W. Richmond, March 27, 1892 (No. 18234, U. S. N. M.).
Turbo, Isthmus of Panama (Atlantic side); Dr. Maack (Mus. Comp. Zool.).

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United States of Colombia: Sabanilla, str. *Albatross* (No. 18235, U. S. N. M.); Carthagena, Atrato Expedition, Dr. A. Schott (No. 2460, U. S. N. M.).

Brazil: Para, Cannavieras and Itabapuana, Thayer Expedition (Mus. Comp. Zool.); Maranhão, Lieut. F. E. Sawyer, U. S. N. (No. 18233, U. S. N. M.).

The type locality of *C. bocourti* is Rivière de Mullins, 20 miles south of Belize, Honduras; of *C. cayennensis* is Guiana.

The small sterile female from Aspinwall described by Ordway[1] doubtless belonged to this species. The specimen, however, is not extant. The only very young specimen I have examined is a female 1½ inches wide, in which the lateral teeth are not widely separated as in adults, but their margins are in contact at base, the posterior edges of the teeth considerably longer than the anterior. The median frontal teeth are proportionally larger than in adults, smaller and more advanced than the lateral.

A single smaller male specimen labeled "*Callinectes africanus* (A. M. Edwards), Senegal" has lately been received from the museum at Paris. Without further evidence I am not able to say that this species differs from *Callinectes bocourti*. The median teeth of the front are less advanced than the lateral; the lateral spine is about twice the length of the adjacent tooth. Length of carapace 18.5; width 36 mm. The type locality of *C. africanus* is Cape Verde Islands. As the range of *Callinectes larvatus* includes these islands and the African coast, it is not improbable that others of our American species are also found there.

CALLINECTES ARCUATUS, Ordway.

(Plates XX; XXIII, fig. 1; XXIV, fig. 8; XXV, fig. 7; XXVI, fig. 7; XXVII, fig. 7.)

Callinectes arcuatus, ORDWAY, Boston Journ. Nat. Hist., VII, p. 578, 1863.

Callinectes pleuriticus, ORDWAY, Boston Journ. Nat. Hist., VII, p. 578, 1863.

Callinectes arcuatus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 228, 1879 (variety of *Callinectes diacanthus*).

Callinectes pleuriticus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 228, 1879 (variety of *Callinectes diacanthus*.)

Callinectes dubia, KINGSLEY, Proc. Boston Soc. Nat. Hist., XX, p. 156, 1879.

Callinectes, sp., SMITH, Third Ann. Rept. Peabody Acad. Sci., 1870, p. 91 (1871).

Carapace very convex, finely granulate; granules very numerous in the median region. Length of intramedial region about one-half its anterior width; length greater than in *C. dancæ*. Front with four stout, triangular, blunt teeth, the middle pair about one-third the size of the outer pair (Plate XXIV, fig. 8). Subfrontal spine exceeding the lateral frontal teeth but little. Suborbital tooth rounded. Antero-lateral margin very arcuate; teeth large, well separated, those nearest the orbit subacute, becoming sharp and spinous toward the lateral spine, which is between two and three times the length of the adjoining tooth. Penultimate segment of male abdomen broad at base; margins subparallel for the greater part of their length (Plate XXV, fig. 7). Appendages (Plate XXVI, fig. 7) reaching or nearly reaching the last

[1] Boston Journ. Nat. Hist., VII, p. 575.

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segment of the abdomen, slightly curved at the tip in the adult. Abdomen of female (Plate XXVII, fig. 7) with fifth segment much narrower distally than proximally, and shorter than sixth. Costæ of manus coarsely granulate. The three carpal spines mentioned by Ordway (he had but one specimen) are present in some of the smaller specimens, but are not equal, and in older specimens the anterior two are more or less rudimentary.

Small specimens are less convex and more prominently areolated than the adult. The large frontal teeth are wider. A single medium-sized individual taken by the *Hassler* at Panama (Mus. Comp. Zool.) has unusually long spines, between three and a half and four times the length of the next tooth.

Size.—The largest male is about $4\frac{3}{4}$ inches wide. The largest female is $4\frac{5}{8}$ inches; one bearing eggs is $3\frac{7}{8}$ inches wide, and has the lateral spine strongly curved forward. Most of the specimens examined are small.

Measurements of Callinectes arcuatus.

Sex.	Length to sinus.	Width.
	mm.	*mm.*
Male	55.5	119
Female	55	118

Specimens have been examined from the following localities:

Lower California and Gulf of California, U. S. Fish Commission str. *Albatross*, 1889: San Bartolome Bay, Lower California (No. 15433, U. S. N. M.); Conception Bay, mouth of Rio Mulege (No. 15432, U. S. N. M.); Algodones Lagoon, Mexico (many small specimens, No. 15431, U. S. N. M.); Horseshoe Bend, Colorado River (No. 15434, U. S. N. M.).

Cape St. Lucas (type locality); John Xantus (Mus. Comp. Zool.).

Guaymas, Mexico; H. F. Emeric (No. 14854, U. S. N. M.).

Acapulco, Mexico; Hassler Expedition (Mus. Comp. Zool.).

Gulf of Fonseca; J. A. McNiel (Mus. Comp. Zool.). Types of *C. dubia*, Kingsley.

Panama (type locality of *C. pleuriticus*); Received from Mus. Comp. Zool. (No. 18511, U. S. N. M.).

Callinectes arcuatus and *C. danæ* are perhaps more closely related than any other two species of *Callinectes*. The front of *C. arcuatus* has the median pair of teeth sharper and more prominent, the lateral pair broader, and the submedian tooth shorter than in *C. danæ*. The antero-lateral margin is more arcuate, and its teeth directed forward instead of outward. Terminal segment of abdomen in male shorter than in *C. danæ*, and appendages of first segment longer, and curved instead of straight at the tips.

CALLINECTES TOXOTES, Ordway.

(Plates XXI; XXIV, fig. 9; XXV, fig. 9; XXVI, fig. 9; XXVII, fig. 8.)

Callinectes toxotes, Ordway, Boston Journ. Nat. Hist., VII, p. 576, 1863.

Callinectes toxotes, A. Milne-Edwards, Crust. Rég. Mex., p. 227, 1879 (variety of *Callinectes diacanthus*).

Callinectes robustus, A. Milne-Edwards, Crust. Rég. Mex., p. 227, 1879 (variety of *Callinectes diacanthus*).

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Carapace very large, coarsely granulate; areolations very prominent. Cardiac region distinctly divided into two lobes by a median furrow. Intramedial area narrow, its length greater than its posterior width. Front (Plate XXIV, fig. 9) slightly upturned, with four broad rounded lobes, the inner pair the smaller and less advanced, and more deeply separated from each other than from the lateral. Submedian tooth small; in the males about as much produced as the outer frontal teeth; in the single female at hand, it is less advanced than the front. Suborbital teeth obtuse. The antero-lateral teeth are triangular, with a short closed fissure between their bases; margins denticulate. The second, third and fourth teeth are almost equilateral and acute; the fifth to the eighth inclusive are acuminate, with successively longer tips, which in the seventh and eighth curve forward. The lateral spine is from two and one-third to nearly three times the length of the preceding tooth. Sternum flat. The penultimate segment of the abdomen of the male (Plate XXV, fig. 9) is constricted in its proximal half, but not so much so as in *C. sapidus* and *C. bocourti*. The appendages (Plate XXVI, fig. 9) reach almost to the extremity of the terminal segment and are more strongly curved than in *C. sapidus* or *C. bocourti*. Abdomen of female (Plate XXVII, fig. 8) similar to that of *C. bocourti*, but the penultimate segment is shorter. The spines on the anterior or inner margin of the merus are strongly curved. Spines of the manus long-pointed. The costæ are very coarsely tuberculate.

Size.—This is the largest species known, attaining a width of 7½ or 8 inches. The largest specimen examined is from Cape St. Lucas, and is in the Museum of Comparative Zoology. Length to sinus, 83 mm.; to tip of frontal teeth, 86; width, 191; length of lateral spine, 21; of preceding tooth, 7.3. This specimen is like old specimens of *C. sapidus* in having the lateral teeth narrower, sharper, and with more concave margins than in younger specimens. The median frontal teeth are also more slender. The frontal teeth are so much worn that their real relative lengths can not be seen; but in all other specimens the median are not so advanced as the lateral, the difference being greater in the smaller specimens.

The only young specimens are three, a male and two females, which were without label in the Mexican exhibit at the World's Columbian Exposition. They have the branchial regions very much swollen, and the posterior margins of the antero-lateral teeth are longer than the anterior. They approach no other known species.

The localities from which specimens have been examined are as follows:

Cape St. Lucas (type locality): John Xantus, 2 large males, 1 ovigerous female (Mus. Comp. Zool.); one dried fragmentary specimen (No. 2413, U. S. N. M.), having the carapace marked in Stimpson's handwriting, "*C. diacanthus*, Cape St. Lucas, Xantus," and bearing no other label.

Acapulco, Mexico (No. 18507, U. S. N. M.). A large number were collected by the Hassler Expedition, and are in the Museum of Comparative Zoology. They are all adult, the smallest being 108 mm. wide.

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Mexico; Mexican Commission, World's Columbian Exposition (No. 18631, U. S. N. M.).

Guayaquil, Ecuador; Prof. James Orton; one male (Peabody Mus., Yale Univ.).

The *C. robustus* of Milne-Edwards, which I think was based on worn examples of *C. toxotes*, is recorded from the Pacific coast of the United States of Colombia.

CALLINECTES BELLICOSUS (Stimpson).

(Plates XXII; XXIV, fig. 10; XXV, fig. 8; XXVI, fig. 8.)

Lupa bellicosa (SLOAT MS.) STIMPSON, Ann. Lyc. Nat. Hist. N. Y., VII, p. 57, 1859.

Callinectes bellicosus, ORDWAY, Boston Journ. Nat. Hist. VII, p. 577, 1863.

Callinectes bellicosus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 227, 1879 (variety of *Callinectes diacanthus*).

Carapace moderately convex, granules fine and very closely set. Areolations less distinct than in *C. arcuatus*. Length of intramedial region less than one-half its anterior width. Front (Plate XXIV, fig. 10) with two slender sharp teeth, widely separated, and between them two very faintly marked median teeth. Submedian tooth sharp, longer than the lateral pair. The inner supraorbital fissure is open, often throughout its length. Border of the orbit outside the fissure advanced beyond that portion inside the fissure. Suborbital tooth slender, well advanced and sharp. Antero-lateral teeth with sides more or less concave and sharp white tips. The lateral spine is very short; in adults less than twice the length of the preceding tooth, in half-grown specimens about twice the length, and in young specimens more than twice. The penultimate segment of the abdomen of the male (Plate XXV, fig. 8) is broad at the base, and constricted in its proximal half. The appendages reach nearly to the extremity of the penultimate segment; they have a double curve (Plate XXVI, fig. 8), the curve being stronger in a vertical direction than in a horizontal. The merus of the chelipeds has four spines on its inner margin; a fifth spine, grading in size and position with these, is situated on the condyle of the ischium. The ridge on the outer and upper margin of the manus is very prominent and marked with large tubercles, which in one nearly full-grown male are spiniform. The other costæ of the manus are less strongly marked, and are often almost smooth.

Size.—The largest male is $5\frac{5}{16}$ inches wide, or 134 mm., with a length to the sinus of 64 mm. The frontal spines are broken. The largest females are immature or sterile, having a triangular abdomen. The dimensions are as follows: Length to sinus, male 46 mm., female 42; entire length, male 48 mm., female 43.5; width, male 97 mm., female 86.

The localities from which specimens have been examined are as follows:

Lower California and Gulf of California, U. S. Fish Commission Str. *Albatross*, 1889: San Bartolome Bay; Magdalena Bay; La Paz Harbor; San Josef Island; Carmen Island; Concepcion Bay; Guaymas; San Luis Gonzales Bay; St. George's Bay; Shoal Point, Colorado River.

La Paz, Lower California; L. Belding (No. 4630, U. S. N. M.).

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Nearly all the specimens collected by the *Albatross* are young.

Ordway gives as the locality for this species "Pinicate Bay, Gulf of California, Mus. S. I." The type is not extant.

CALLINECTES NITIDUS, A. Milne-Edwards.[1]

Callinectes nitidus, A. MILNE-EDWARDS, Crust. Rég. Mex., p. 228, 1879 (variety of *Callinectes diacanthus*).

Callinectes diacanthus, var. *Callinectes nitidus*, A. MILNE-EDWARDS, Crust. Rég. Mex., explanation of pl. XLI, 1879.

Callinectes diacanthus, A. MILNE-EDWARDS, Crust. Rég. Mex., pl. XLI, 1879.

In this *Callinectes* the carapace is broad and the antero-lateral borders form a curve of a large circle; the teeth are large and strong. The front is little advanced; its median teeth are rudimentary, separated from each other by a well-marked notch, below which can be seen the projection of the epistome, which is very prominent. The carapace is ornamented with very fine granulations, and has a more shining appearance than ordinary. The abdomen of the male is narrow; in all the examples which I have examined the penultimate article has a membranous articulation at its base. The intromittent organs of the male are slender, straight, and extend to near the extremity of the penultimate article of the abdomen.

The carapace is violet; the under side a grayish-yellow, with the exception of the abdomen of the female, which is rose color, and has a black band on each article. The feet are tinged with blue and red. The plate was colored after a sketch made of the living animal by M. Bocourt. The Paris Museum possesses a large number of *Callinectes* from Chile, which resemble completely those of Guatemala.

Abundant at Tanesco, Guatemala, on the borders of the Estéros, hidden in the sand.

DEFORMITIES.

On Plate XXIII are shown three deformed claws of *Callinectes sapidus* in the collection of the National Museum. They are different from those figured by Lucas[2] and by Faxon.[3]

In a right claw from the Potomac River (fig. 4), received from J. F. H. Sisson, there is a duplication of the dactylus and the index finger, the inner pair being complementary to the outer and not a repetition of the right dactylus and index finger. The outer pair are simple and have each one row of teeth; the inner pair are forked near the tips; the dactylus has one row of teeth continued on both forks; the index finger is broader and has two rows of teeth converging to its base, each row terminating at the tip of a fork.

In a left claw from Willoughby Point, Virginia (fig. 3), the index is divided into two branches, one above the other. The lower branch corresponds in length to the dactylus and has an upper row of teeth;

[1] This species is known to the writer only from Milne-Edwards' description.

[2] Ann. Soc. Entom. France (2) II, pl. 1, fig. 1.

[3] Bull. Mus. Comp. Zool., VIII, pl. II, fig. 5.

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the upper branch is much shorter and curved inward at the extremity; it has a row of teeth on both the upper and lower margins of its outer surface.

In a left claw from the same locality (fig. 2) the index is normal; the dactylus is abruptly bent downward at the middle, forming a sort of heel, and then turned obliquely forward, and carries but one row of teeth.

In a lot of *Callinectes sapidus* from Indianola, Texas, there is a remarkable series of malformations of the abdomen. One male, 54 mm. long, has the penultimate segment widening gradually toward the antepenult, which for its distal two-thirds has almost straight sides, instead of being concave as usual. Another male, 51.5 mm. wide, has broader segments than the last, and they are seven in number, as in the female. A very small male, 24 mm. wide, has the abdomen still wider proportionally, but the sutures between the third, fourth and fifth segments less distinct. Another individual, 55 mm. in width, has the abdominal appendages of the male, but the shape of the abdomen is more nearly related to that of the female than any of the above. The first five segments are broad, as in the female, but the fifth and sixth narrow rapidly toward their union, making the sixth subcircular. The appendages of the first segment reach to the middle of the sixth, and are very divergent distally. Attached to one side of the third segment is a foreign growth, probably *Peltogaster*.

Most of the young females in this lot have the usual triangular abdomen with straight sides, and the fourth, fifth and sixth segments soldered together. One, however, no larger than the others, has an abdomen with convex sides and segments coalesced; the genital orifices are not present. A female of about the same size is in all respects like adult forms.

In the Museum of Comparative Zoology there is a female *Callinectes sapidus*, about 85 mm. wide, with circular abdomen, bearing, besides the usual appendages, a pair on the first segment similar to those common to the male.

HABITS AND ECONOMIC VALUE.

In "The Fisheries and Fishery Industries of the United States,"[1] Mr. Richard Rathbun gives an account of the habits, distribution, and market value of *Callinectes hastatus* (now *C. sapidus*), reviewing all that has been written on the subject down to that date.

In "Notes on the Crab Fishery of Crisfield, Maryland,"[2] Dr. Hugh M. Smith deals very fully with the industry at that place, including the modes of capture, methods of preparation for the market, etc.

In recent reports and bulletins issued by the United States Fish

[1] Section I, Natural History of Useful Aquatic Animals, pp. 775–778, 1884.

[2] Bulletin U. S. Fish Commission, No. IX, p. 104, 1889.

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Commission[1] can be found tabular statements showing the number and value of edible crabs taken in each State.

It is not yet known whether any other species of *Callinectes* than *sapidus* is brought to market, but as both *C. ornatus* and *C. larvatus* are abundant in the Gulf States, they are undoubtedly taken for this purpose. It would be interesting to know to what extent these and other species take the place of *C. sapidus*, and how they differ in habits, color,[2] etc.

OBSERVATIONS UPON THE HABITS OF CALLINECTES SAPIDUS.

Three correspondents of the National Museum—Hon. John D. Mitchell, of Victoria, Texas; Judge Benjamin Harrison, of Pensacola, Florida; and Mr. Willard Nye, jr., of New Bedford, Massachusetts—have kindly permitted me to insert here the following notes based on personal observation of *Callinectes sapidus*. The facts presented by Mr. Mitchell regarding the shedding are of especial interest, as our knowledge concerning the frequence of this occurrence is very meager.

Notes by John D. Mitchell.—Born on an isolated point on the Bay, and inheriting the naturalist's instincts from my mother, I made this crab (*Callinectes sapidus*) one of my earliest playthings, and it has been an interesting study since. When full grown, it measures about 7 inches from point to point of the shell in the male, and 5 inches in the female. The claws, legs, and shell of the male are tinted with blue, those of the female with red; the apron of the male is narrow, that of the female is broad. The mother crabs live in the Gulf and in the deep water passes and bayous adjacent to the Gulf. The eggs begin growing in the spring under the apron, and hatch the latter part of May or June, the young clinging to the apron for several days. When first hatched, they are very little more than two eyes, and look like anything but a crab. I know little about the number of times the crab sheds from the time of leaving the mother's apron until it gets its crab shape, which is inside of three months. I have seen the little fellows so thick near the margin that the water would look murky and thick, and thousands could be scooped in the two hands placed together, and their cast-off shells would form a gray streak along the water's edge. They collect in immense numbers along protected shores and nooks, shedding several times and getting their shape in September, when they

[1] Statistical Review of the Coast Fisheries of the United States. < Rept. U. S. Commr. of Fish and Fisheries for 1888 (1892). Report on the Fisheries of the New England States, by J. W. Collins and Hugh M. Smith. < Bull. U. S. Fish Commission, X, 1890 (1892). Report on the Fisheries of the South Atlantic States, by Hugh M. Smith. < Bull. U. S. Fish Commission, XI, 1891 (1892). A Statistical Report on the Fisheries of the Gulf States, by J. W. Collins and Hugh M. Smith. < Bull. U. S. Fish Commission, XI, 1891 (1892). Report on the Coast Fisheries of Texas, by Charles H. Stevenson. < Rept. U. S. Commr. of Fish and Fisheries for 1889–1891 (1893).

[2] H. W. Conn, in Johns Hopkins University Circulars, November, 1883, describes the color variation in the claws of the sexes of *C. sapidus* (= *hastatus*).

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start on their great migration across the bays for the north shores, where they enter the creeks and estuaries and go upon the shoals, where they remain until grown, burying themselves in the mud and sand in winter.

They shed twice each summer for three summers, when they reach their full size and shed no more. The young crabs grow one-third larger after each shedding in the second and third summer. The newly shed crab is a great delicacy. The shedding is done mostly at night, the smaller ones coming very near the shore for that purpose. I have observed the process many times with the aid of a lantern, and have gathered many a mess of them, frequently waiting for some fellow to finish shedding. About ten minutes is occupied in the process, though I have never held a watch on one.

During the third summer the females are impregnated by old males, after which the red markings of the former appear, the apron becomes dark, and its form changes from triangular to broadly ovate. After impregnation and shedding for the last time, the females start for the Gulf and meet the males no more, one meeting being sufficient for life. They lay their first eggs in their fourth summer. The males remain among the growing crabs, and are the ones taken for the table.

The average life of the male crab is as follows: Take him in his third summer, his shell is 5 inches, and he has some green and blue tints, and occupies the place among crabs that a 16-year-old boy does among men. He selects a safe place for his last shedding (he sheds twice during the summer), generally about September, near an old log, stone, or something of the kind. Failing to find anything, he will dig a place in the sand, 12 or more inches in diameter. After shedding and going through his calisthenic performance to get himself into shape, his shell is 7 inches wide, and the woman's form on his back becomes prominent, though it is always discernible on the young ones. It takes him the balance of the season to get back his strength and harden his flesh. The colors, green, brown, blue and white, are clear and bright, and the crab is very pretty. He comes back to the shallows in the spring of his fourth year, a little sobered in color, but in his best condition. He has two objects in life, eating and propagation. He eats anything he can get in the way of dead fish or flesh. He will eat the young of his own species, if he can catch them. I have seen him make a rush among fiddlers feeding near the water, catch one, and take it back to the water to devour it.

In courting he is ludicrous to the onlooker. The breeding females are those in their third summer. Meeting or approaching one of these, he will elevate himself on the tips of his legs, getting as high from the ground as possible, extend his claws to their widest extent, supporting himself with his paddles, and in this position he will strut slowly and pomposly in front of her. Should another male appear, a battle ensues. The sexual act lasts from 3 to 6 hours. The female will accept

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the male any time during her third summer, and as she sheds twice during this time, it frequently happens that he finds her while in a soft condition, taking possession just the same. Woe betide the luckless young male he finds too soft to run! There will be one soft crab less and one old male will have a good dinner. There is no sentiment about *C. sapidus*.

How long the male lives I do not know for certain, but I think about four years from his last shedding, which would make his entire life seven years. When he becomes superannuated, he seeks quiet nooks and safe shallows and prepares for death. In the fall (October and November) I have found numbers of these old fellows scarcely able to move and too feeble to bite; their flesh is all gone or is soft and watery, and evaporates when dead or the minnows soon clean it out. A day or so after death, if the waves do not wash them to pieces, the shells are as clean and empty as any cast-off shell. I think this is the kind of shell which, occasionally found, gives rise to the idea that the crab sheds after maturity. It sheds to grow and for no other purpose, and when through growing it is through shedding.

I have seen full-grown females with a triangular apron, perhaps about three each summer, and have always known them as neuters. Many specimens are deformed in the fingers. This I attribute to the accident of losing them, followed by some sort of pressure on the new fingers before they have become hard—as, for instance, in a sudden fright they might exert them over shells or other hard substances and permanently bend them. I remember one adult male whose claws were crossed at the points, and another in which the points worked past each other like a pair of shears. The fingers and claws that are renewed after losing the original ones are never so large or so effective as the original ones. This recuperative power lasts in full force only during the growing years and diminishes with age. A middle-aged crab will reproduce a claw only half the size of the original, and an old crab will reproduce none, or only a small nub that is useless.

There is no one, I think, engaged in the crab fishery on this coast. Occasionally the negroes of Port Lavaca will send a few dozen boiled to the interior towns and retail them at 10 cents each. Mr. F. V. Gentry, of Port Lavaca, has shipped a few lots of adult crabs, but there is no one making a specialty of catching them. I believe he paid 25 cents per dozen.

I have seen *Callinectes sapidus*, or what I took to be them, in the Guadalupe River at Victoria; in the Navidad River, Jackson County, 20 miles above Texana; and I caught three, which were *C. sapidus*, in a spring branch which flows into the Garcitas Creek, Victoria County. They were 40 miles from salt water, air line. They were different in color from those in salt water, being of a reddish brown; otherwise I saw no difference in them.

On November 14, 1894, while seeking stone crabs in the mouth of

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Chocolate Bay, near Port Lavaca, I found in deserted stone-crab holes four soft crabs, *Callinectes sapidus*,—one female in her second year, one male in his second year, one male in his third year, and one male in his fourth year, or full grown. I also found four aged crabs, too feeble to run or nip. They had sought a quiet nook, protected by rushes and salt grass, and were patiently awaiting dissolution. I attribute the late shedding to our late fall. We had had no frost, and wading was very pleasant.

The third week of September, 1895, I spent cruising in Matagorda and adjacent bays, and had another chance to observe the habits of these crabs. There is a cove, terminating in a small bayou, on the north side of Sand Point, Calhoun County; this point separates Matagorda and Port Lavaca bays. The weather was easterly and the cove protected. Around it we stretched a seine and caught about 200 adult male crabs, 22 of which had in their possession a female; 19 of these females were verging on maturity; 2 were shed for the last time (that is, full grown), but still soft, one of them being held upside down, and one female was full grown, her new shell about three days old. Twenty-one of these couples were interlocked in the same manner—that is, the male had his front leg on either side passed from the rear around the paddle and legs of the female, bringing her well in front of him, and held so tightly that many of them were lifted from the water and put into the boat without loosing their hold. None released his companion until roughly handled. One was holding on to the sides of the seine with the rear feet and to his companion with his front feet, and was eating a small fish which was still alive. He held on to both fish and crab until placed in the skiff. In all the crabs observed—not far from 1,000—the only full-grown females were the three above described, of which two were yet soft and the third had shed very recently.

Notes by Benjamin Harrison.—On both the east and west coasts of Florida, *Callinectes sapidus* is quite common; nor is it confined to salt water. On the St. Johns River, it is found more than 100 miles from the sea. I have seen many specimens in Lake George, 125 miles from Jacksonville. On the west shore of Lake George a salt spring runs through a deep creek into the lake. Here the common crab swarms. Where the creek empties into the lake there is a wide expanse of shallow water with clean white sand. Here the crabs come out at night in great numbers to feed, and I have frequently seen them seize small fish and collect about the refuse from our camp. Evidently they have no distaste for the fresh water of the lake.

Both on the east and west coasts they like quiet, shallow waters, and prefer sandy bottoms. They bury themselves in the sand to escape observation, and will do this as soon as they find speed ineffective when pursued. During the spring months they are much more "in evidence," because then they seek the waters near the shore warmed by the sun. While mating they are much less voracious than at other times. After

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mating they are daring and predatory, soon regaining the strength and flesh they have lost.

Now each crab has a favorite retreat, from which he does not wander far. When chased, he returns to it. He has a regular beat, and he patrols it at short intervals day and night, except when gorged with food. If he finds a small bit, he will eat it immediately. If more than he wants at the moment, he will try to drag it to his sheltered nook under a log or rock. If he can not carry it, he will eat to repletion and then try to bury it, and will remain in the neighborhood. If food is discovered within the territory of one, others will cross the boundary, and I have seen lively fights. But as soon as the visitor gorges himself, he seems disinclined to active exertion and only "covers what he stands on," while another drives off the crowd and eats. I have often dropped in a dead fish and watched this performance. From what I have seen, I judge that the sense of smell is well developed in *Callinectes sapidus*. I have covered the fish, but it was soon found, and other crabs came from a distance. Undoubtedly they have keen sight, but they seem to depend more on their sense of smell. In the spring, when the male and female are together, there seems to be much community of feeling between the two. They hunt in couples; they do not struggle with each other for food, but share it, and I have many times seen the two combine to drive off a stranger. Later, however, they treat each other as strangers, and after April I have seen the two "partners" fight.

They retire to deeper water in winter. We see them return to their summer haunts every warm day. They do not seek the deepest water, but find shelter where the water is about 4 or 5 feet deep. They do not roam about at night-time till the water is quite warm. During December, January, February and March they must eat very little, yet they come out strong and active. Therefore, I think they "half-hibernate" (if I may use the expression) as the bears do in this State.

In 1890 I saw fully 500 sea bass in Lake George, through which the St. Johns River runs, which had died from the attack of a fungus-looking parasite. I found two crabs with the same disease. Both died. I saw many other crabs in the same waters apparently entirely free from any sickness.

I have seen the common leech on joints of the crab,[1] but never satisfied myself it was anything but a passenger. So of a red worm about 2 inches long. I was not sure in either case that the crab was attacked.

Notes by Willard Nye, jr.—The largest and oldest of our common blue-claw crabs I have generally found in some small pool in a marsh where the tide refreshed the water at each rise. Here, selecting a place under some rock or sunken drift log, the crab takes life in a most easy way, as with each tide the small fish swarm into the pool

[1]The *Myzobdella lugubris* is a small leech, which lives on the "edible crab" (*Callinectes hastatus*), adhering to the soft membrane between the joints and at the base of the legs. (Verrill, Vineyard Sound Report, p. 458.)

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to see what they can pick up, and many of them are taken in by crabby. Taking advantage of such spots in the sand or mud and keeping out of sight, and then roiling up the water, they attract these small fish and secure a good meal. After a crab has reached his extreme growth, I do not think he sheds his shell, as I have often found them with a long growth of moss on their backs. As October draws to a close, the blue-claw moves off into deep water, and at this season may frequently be seen paddling near the surface as he works downstream with the tide. They are found all winter in the channels near the mouths of our rivers, where the water is salty. In some places I have seen the ice covered with them, where they had been caught by people spearing eels. At this season they are very torpid. A number of years ago the September storms closed up the entrance of Quick Sands Pond, Rhode Island. Early in November there came a sharp cold spell, and on going down to where the washed-in beach made a dam to the creek, I think I saw more blue-claw crabs in five minutes than I have ever seen since in the whole of my life. The bottom was blue and green with them. For, you see, as the water became cold they moved down pond and tried to get back to the ocean the way they came in in the spring, and here in the shallow water you would see hundreds snapping their claws out to catch the young menhaden which, like themselves, had become imprisoned by the closing creek. These crabs were much more ugly than any I have seen, and if in catching them with a scoop net you broke the shell of one and he tried to get away, he was at once seized on by those nearest and eaten up without the slightest remorse. These crabs were so thick that with a single scoop of a small net I hauled out eleven. A few days after I was at the pond, the weather became much colder and the crabs started out over the beach to the ocean, a distance of about 400 feet. Some bass fishermen then caught over six barrels while the crabs were on their way across. This is the only instance which I ever knew of the blue-claw crab leaving the water and walking across lots on his own hook.

EXPLANATION OF PLATES.

PLATE XII.

Callinectes sapidus, Rathbun, = *C. hastatus* (Say). Male. Much reduced.

PLATE XIII.

Callinectes sapidus acutidens, Rathbun, new subspecies. Male. Reduced about one-fifth.

PLATE XIV.

Callinectes sapidus, varying toward *acutidens*. Male. Reduced about one-fifth.

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PLATE XV.

Callinectes ornatus, Ordway. Male. Reduced about one-fifth.

PLATE XVI.

Callinectes danæ, Smith. Male. (Type of *Lupa dicantha*, Dana.) Reduced about two-thirds.

PLATE XVII.

Callinectes larvatus, Ordway. Male. Reduced about one-fifth.

PLATE XVIII.

Callinectes tumidus, Ordway. Male. Reduced about one-fifth.

PLATE XIX.

Callinectes bocourti(?), A. Milne-Edwards. Male. Considerably reduced.

PLATE XX.

Callinectes arcuatus, Ordway. Male. Reduced about one-fourth.

PLATE XXI.

Callinectes toxotes, Ordway. Female. Reduced about one-third.

PLATE XXII.

Callinectes bellicosus (Stimpson). Male. Reduced about one-fifth.

PLATE XXIII.

Fig. 1. *Callinectes arcuatus*, Ordway. Young male. (Perhaps type of *C. pleuriticus*, Ordway.) Reduced about one-fourth.
2–4. Deformed claws of *Callinectes sapidus*. Reduced about one-third.

PLATE XXIV.

Frontal outlines of *Callinectes*. Slightly enlarged.

Fig. 1. *Callinectes sapidus*.
2. *Callinectes sapidus acutidens*.
3. *Callinectes ornatus*.
4. *Callinectes danæ*.
5. *Callinectes larvatus*.
6. *Callinectes tumidus*.
7. *Callinectes bocourti*.
8. *Callinectes arcuatus*.
9. *Callinectes toxotes*.
10. *Callinectes bellicosus*.

PLATE XXV.

Abdominal outlines of *Callinectes*. Male. Slightly enlarged.

Fig. 1. *Callinectes sapidus*.
2. *Callinectes ornatus*.
3. *Callinectes danæ*.
4. *Callinectes larvatus*.
5. *Callinectes tumidus*.
6. *Callinectes bocourti*.
7. *Callinectes arcuatus*.
8. *Callinectes bellicosus*.
9. *Callinectes toxotes*.

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PLATE XXVI.

Abdominal appendages of *Callinectes*. Male. Slightly enlarged.

Fig. 1. *Callinectes sapidus.*
2. *Callinectes ornatus.*
3. *Callinectes danæ.*
4. *Callinectes larvatus.*
5. *Callinectes tumidus.*
6. *Callinectes bocourti.*
7. *Callinectes arcuatus.*
8. *Callinectes bellicosus.*
9. *Callinectes toxotes.*

PLATE XXVII.

Abdominal outlines of *Callinectes*. Female. Slightly reduced.

Fig. 1. *Callinectes sapidus.*
2. *Callinectes ornatus.*
3. *Callinectes danæ.*
4. *Callinectes larvatus.*
5. *Callinectes tumidus.*
6. *Callinectes bocourti.*
7. *Callinectes arcuatus.*
8. *Callinectes toxotes.*

PLATE XXVIII.

Fossil *Callinectes*. Natural size.

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CALLINECTES SAPIDUS, MALE

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CALLINECTES SAPIDUS ACUTIDENS, MALE

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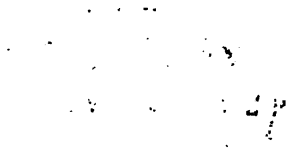

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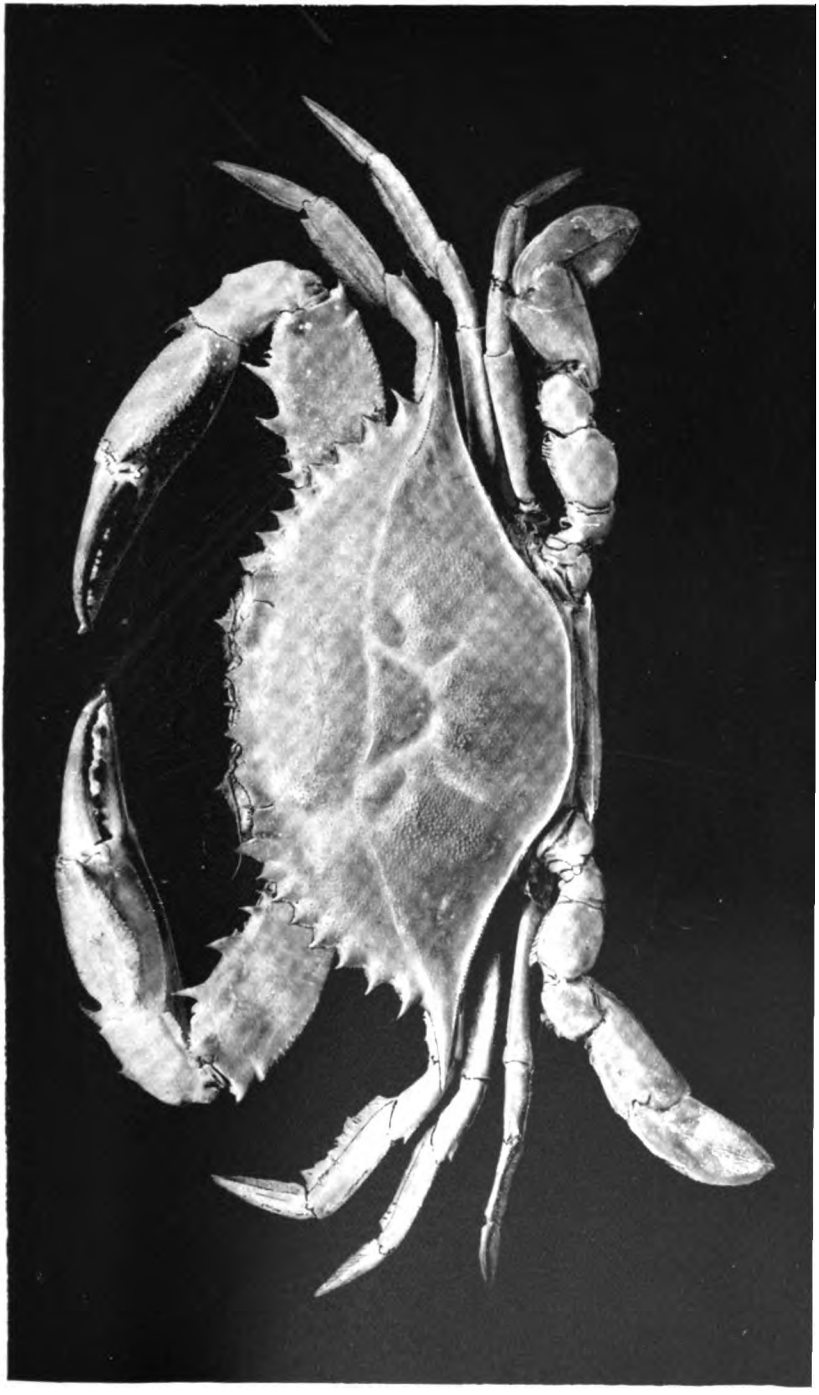

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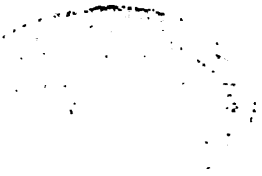

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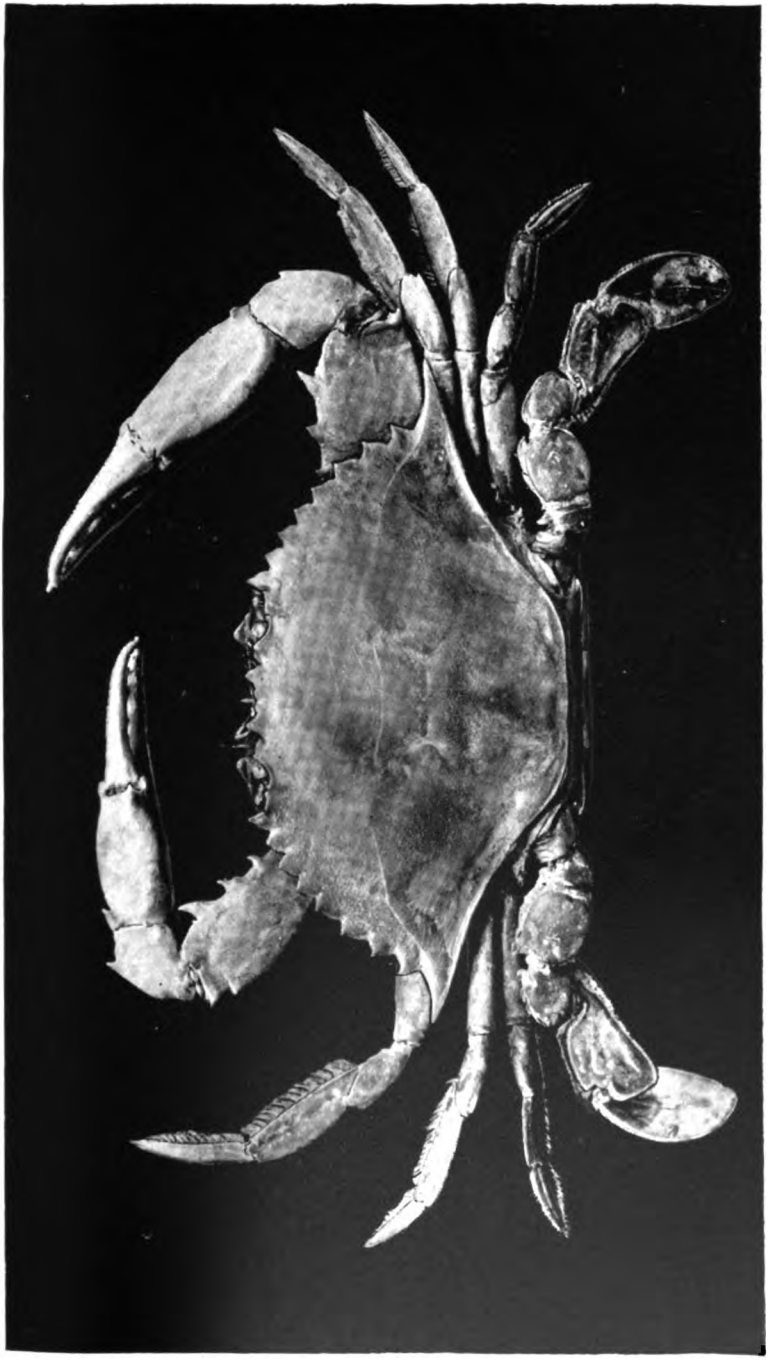

CALLINECTES ORNATUS, MALE

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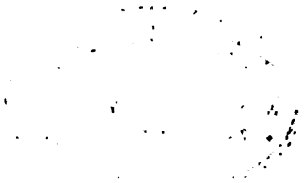

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CALLINECTES DANÆ, Smith, MALE
Type of *Lupa dicantha*, Dana
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CALLINECTES LARVATUS, MALE

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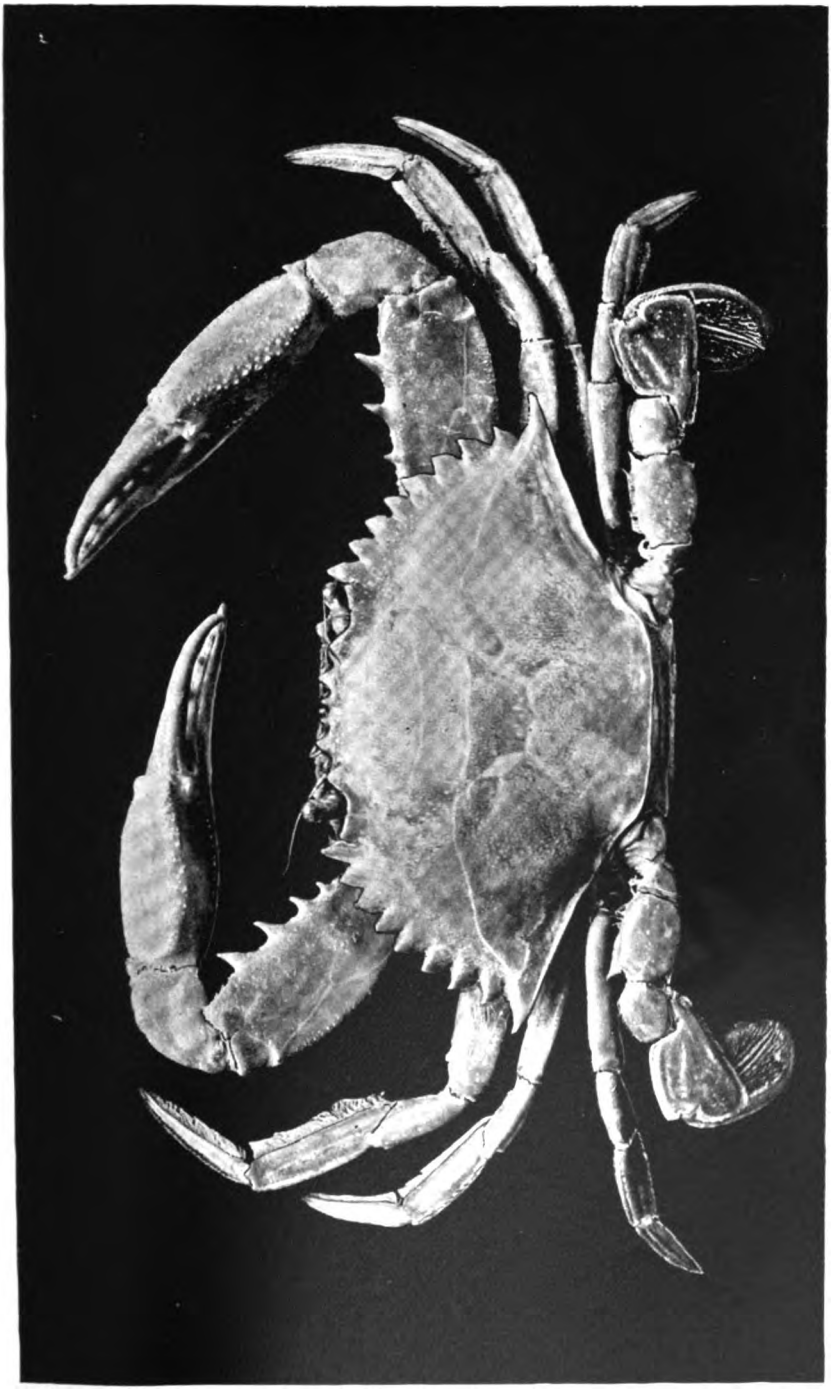

CALLINECTES TUMIDUS, MALE

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CALLINECTES BOCOURTI (?), MALE

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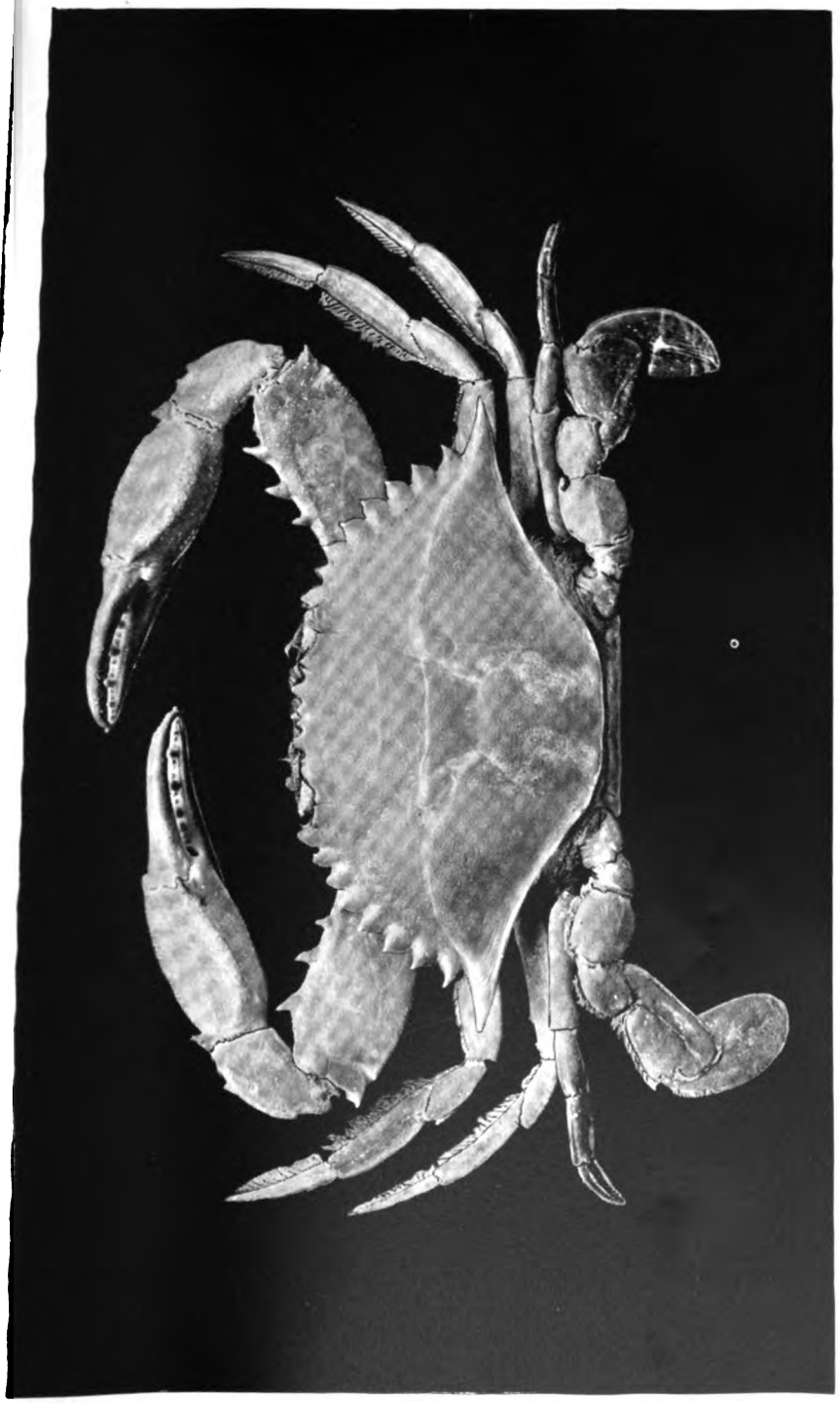

CALLINECTES ARCUATUS, MALE

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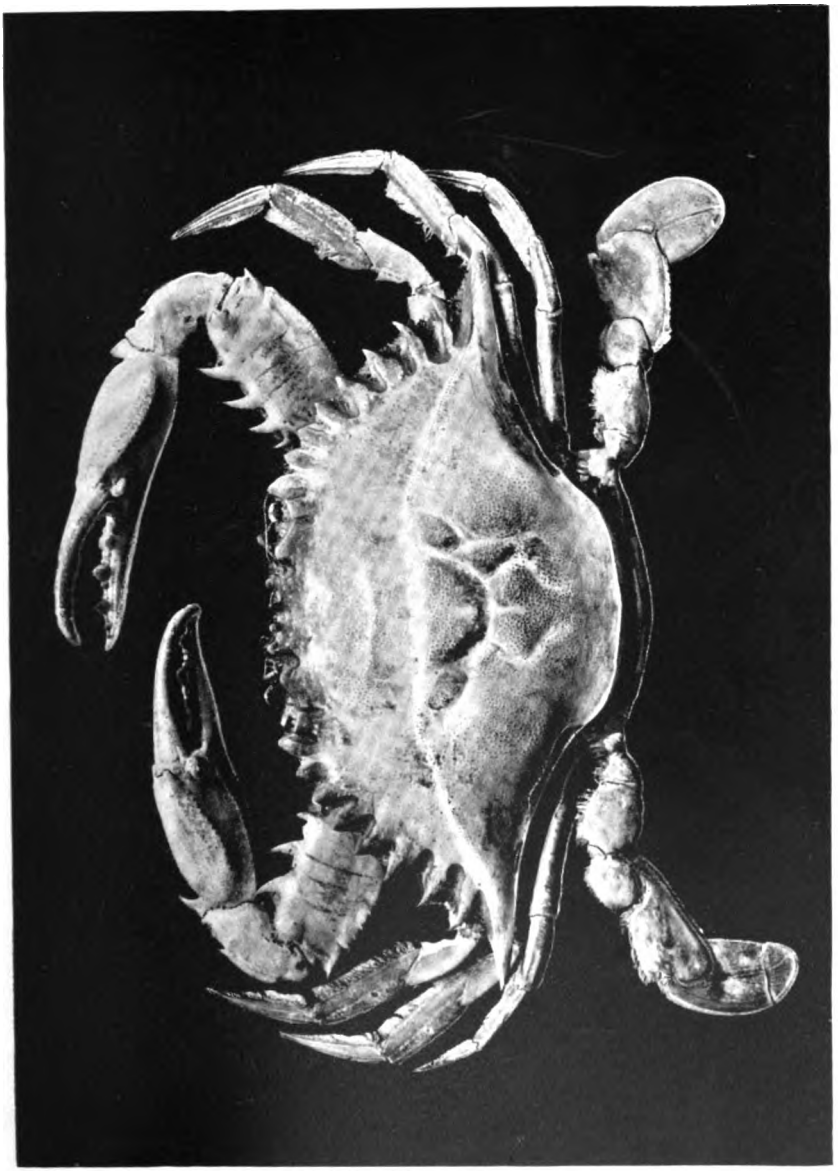

CALLINECTES TOXOTES, FEMALE

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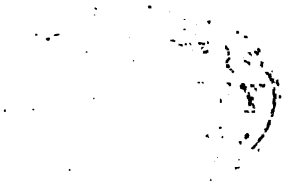

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CALLINECTES BELLICOSUS, MALE

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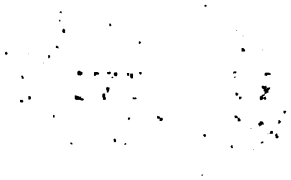

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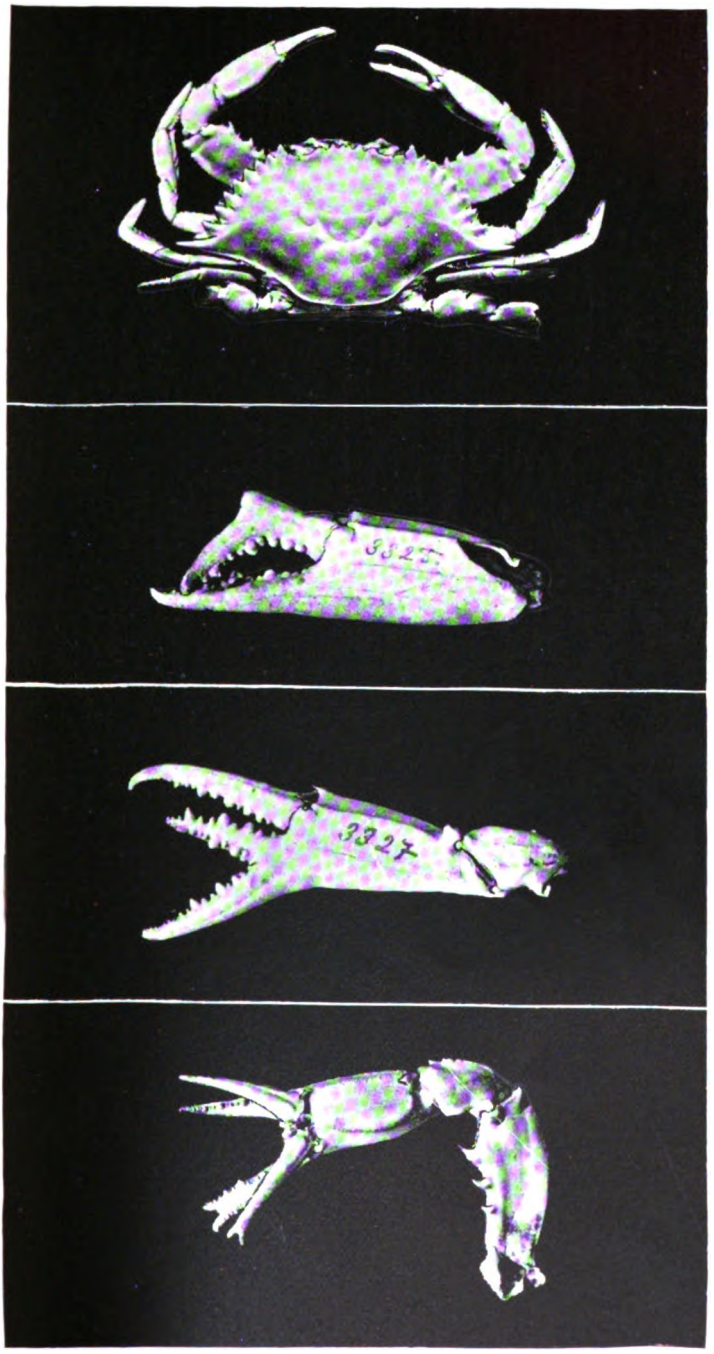

CALLINECTES ARCUATUS, MALE, AND DEFORMED CLAWS OF CALLINECTES SAPIDUS

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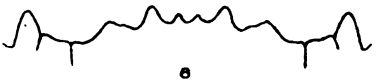

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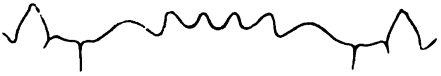

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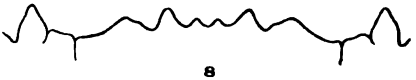

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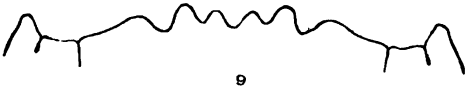

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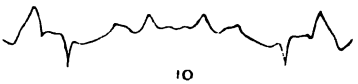

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FRONTAL OUTLINES OF CALLINECTES

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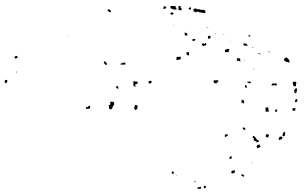

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FOSSIL CALLINECTES.

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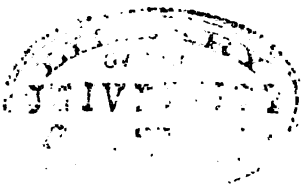

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DESCRIPTIONS OF TWO NEW SPECIES OF FRESH-WATER CRABS FROM COSTA RICA.

By MARY J. RATHBUN,

Second Assistant Curator, Department of Marine Invertebrates.

THE Museo Nacional de Costa Rica has recently sent, through Mr. J. Fid. Tristan, a number of crabs and shrimps to the United States National Museum for identification. Among them were found two new species of *Pseudothelphusa.*

PSEUDOTHELPHUSA MAGNA, new species.

(Plates XXIX; XXX, figs. 7-10.)

Closely allied to *P. richmondi*, Rathbun.[1] Carapace wider than in *P. richmondi*, branchial region more swollen, cervical suture sinuous. The surface is covered with flattened granules, some of which on the anterior half of the carapace are large and dark-colored, looking like scales, but almost smooth to the touch. The frontal lobes seen from above are separated by a broad and deep notch; margin uneven, more advanced in its inner portion, passing gradually into the orbital margin; the curve is much less abrupt than in *P. richmondi.* In Plate XXIX a portion of the maxilliped shows beneath the front. The front seen from before is much wider and less deep than in *P. richmondi* and the outer margins more oblique (Plate XXX, figs. 6 and 7). The external angle of the orbit is nearly as advanced as the front, while in *P. richmondi* it is much less so. The spines or spinules of the lateral margin are proportionally smaller than in *P. richmondi.* The eyes also are much smaller than in *P. richmondi* and do not fill one-half the depth of the orbit. The first abdominal appendage of the male is similar in character to that of *P. richmondi.* It has three teeth at the extremity on the upper side. (See upper left-hand portion of fig. 9.) The longitudinal plate on the

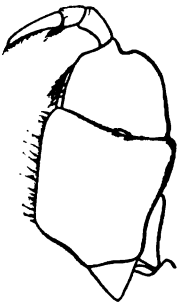

Fig. 1.

OUTER MAXILLIPED OF PSEUDOTHELPHUSA MAGNA.

Natural size.

[1] Proc. U. S. Nat. Mus., XVI, 1893, p. 654, pl. LXXV, figs. 6-10.

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inner side of the lower portion, shown in Figure 10, is much longer than the corresponding part in *P. richmondi.* The merus of the outer maxillipeds is longer and narrower in this species.[1]

Chelipeds unequal, large and strong. The merus has a row of very stout conical teeth on its inner margin, as a rule becoming smaller proximally and continued on the ischium; the lower edge has a row of small tubercles; the outer margin has a wide band of prominent squamose tubercles, which, toward the carpus, become rugose lines. The palmar portion of the manus is longer than in *P. richmondi,* the margins of its surface less convex. The outer surface of carpus, propodus and dactylus is covered with a network of dark brown, and numerous granules of still darker color. The teeth of the fingers have a dark band across their bases and a lighter line around their cutting edges. Ambulatory legs thick, meri with edges rough or slightly spinulous. Inner lower margin of meri of first pair with prominent tubercles. This margin is smooth in *P. richmondi.*

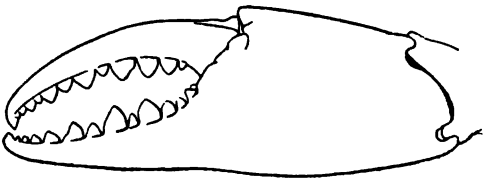

Fig. 2.

LARGE HAND OF PSEUDOTHELPHUSA MAGNA.

About three-eighths natural size.

Dimensions.—Largest male, length 84 mm., width 135 mm.

Color.—Yellowish brown.

Habitat.—Pozo Azul, 800 or 1,000 feet above the sea, two males (Nos. 19048, 19049, type, U. S. N. M.) collected by J. C. Zeledon, April 4, 1888; Rio Maria Aguilar, one male, collected by A. Lizano, May 29, 1891; also one female (No. 19050, U. S. N. M.) collected by J. Fid. Tristan; Rio Torres, one male, collected by J. Fid. Tristan.

This species is the largest of the known Pseudothelphusidæ.

PSEUDOTHELPHUSA TRISTANI, new species.

(Plate XXX, figs. 1-5.)

Fig. 3.

OUTER MAXILLIPED OF PSEUDOTHELPHUSA TRISTANI.

About four times natural size.

Carapace smooth and shining, inconspicuously granulate near the lateral margins; grooves deep; branchial region much swollen in its anterior half. Front with a well-marked crest, which is rough with punctæ but not tuberculate, and terminates at the orbital border just behind the insertion of the eye. Lower and outer margins with a prominent punctate ridge. Outer half of the superior orbital border finely crenulate; inferior border crenulate. Antero-lateral margin denticulate, and with two well-marked teeth behind the orbit.

[1] Compare fig. 1 in text with fig. 9, pl. LXXV, Vol. XVI, Proceedings U. S. National Museum.

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The sixth segment of the abdomen in the male is shorter than the seventh; the seventh is very broad and obtuse. The appendages of the first segment (Plate XXX, figs. 3 and 4) are very different from those of any other species that I have seen. The character of the chelipeds is shown in Plate XXX, figs. 1 and 2. The carpus, propodus and dactylus are granulate. The ambulatory legs are spinulous above; the propodal joints are spinulous below.

Dimensions.—Length of male, 18.7 mm.; width, 30.8 mm. Length of female, 18 mm.; width, 29.9 mm.

Color.—Very dark brown; lower side and legs lighter.

Habitat.—"La Mina," Rio Torres, north of San José, 1,130 meters above the sea. One male (No. 19047, U.S.N.M.) and one female, collected by J. Fid. Tristan, August 7, 1894.

EXPLANATION OF PLATES.

PLATE XXIX.

Pseudothelphusa magna, male. Less than one-half natural size.

PLATE XXX.

Fig. 1. *Pseudothelphusa tristani*, male. Natural size.
2. *Pseudothelphusa tristani*, male, large hand. Slightly enlarged.
3. *Pseudothelphusa tristani*, male, right abdominal appendages, outer side. Three and one-half times natural size.
4. *Pseudothelphusa tristani*, male, left abdominal appendages, lower side. Four times natural size.
5. *Pseudothelphusa tristani*, front. About two and one-half times natural size.
6. *Pseudothelphusa richmondi*, front. About two and two-thirds natural size.
7. *Pseudothelphusa magna*, front. About one and one-third natural size.
8. *Pseudothelphusa magna*, abdomen of male. Slightly reduced.
9. *Pseudothelphusa magna*, male, first abdominal appendage of right side, outer view. One and one-half times natural size.
10. *Pseudothelphusa magna*, male, first abdominal appendage of right side, lower view. One and one-half times natural size.

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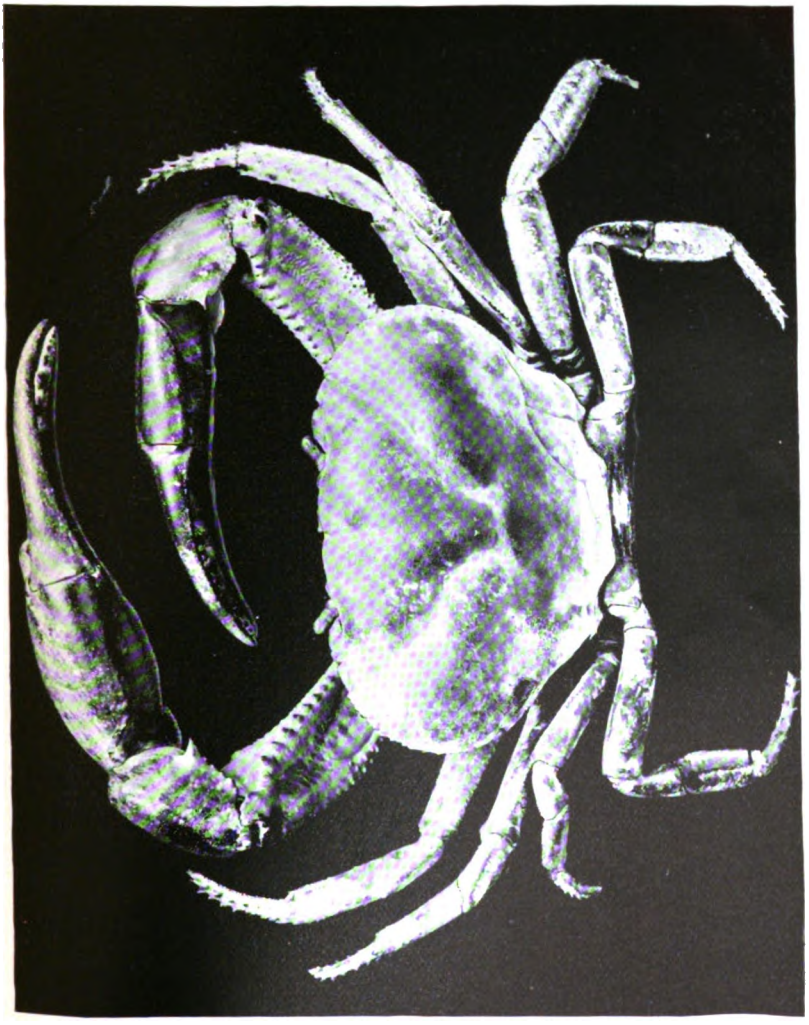

PSEUDOTHELPHUSA MAGNA, MALE

FOR EXPLANATION OF PLATE SEE PAGE 379

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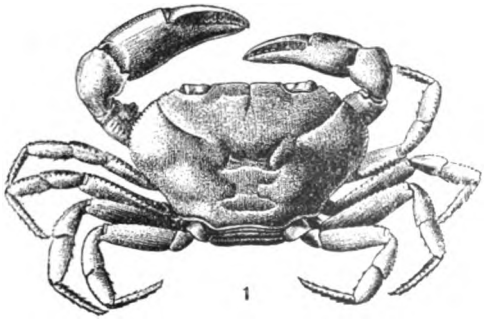

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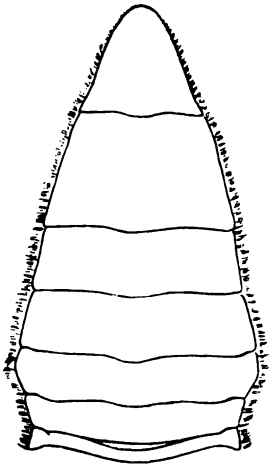

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FOR EXPLANATION OF PLATE SEE PAGE 379

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DESCRIPTION OF FOUR NEW TRIASSIC UNIOS FROM THE STAKED PLAINS OF TEXAS.

By CHARLES TORREY SIMPSON,
Aid, Department of Mollusks.

THE MATERIAL on which this paper is based was sent to the writer for examination by Prof. E. T. Dumble, State geologist of Texas.[1] It was obtained from the Dockum beds, an extensive formation which underlies all or nearly all the Staked Plains of Texas, and southeastern New Mexico, reaching farther back into that Territory northwest of the Plains, and having some extension under the Cretaceous area south of them in Texas. The limit of the plains on the east, north and west is marked by an escarpment, which is usually from 100 to 200, and sometimes 300 or 400 feet high. The basal portion and occasionally nearly all of this escarpment is composed of what are believed to be Triassic beds. They usually extend some 6 or 7 miles beyond the base of the great plain.[2]

These beds are composed of horizontal strata of sandstone, conglomerate and clay; and are overlaid in some places by Cretaceous, but more generally Tertiary strata, and underlaid by the rocks of the Permian period, whose lithological characters are so different from those believed to be Triassic that the latter can usually be recognized without trouble. The slight difference in dip, and the sudden change in lithological characters from the Triassic to the Permian, point conclusively to a break in the sedimentation of the two deposits. According to the evidence of the fossils and the characteristic material forming them, the Dockum beds seem to have been deposited in an inland, fresh-water basin. The vertebrates, as determined by Prof. E. D. Cope, were shallow fresh-water animals.

A few fragments of bivalve shells were collected by Professor Cope in the valley of Gallinas Creek, New Mexico, associated with vertebrate remains, which latter led their discoverer to believe the formation was

[1] The paper and the accompanying figures were prepared for the report of the Texas Geological Survey, but on account of the failure of the legislature of that State to provide funds for carrying on the investigation, the work of the Survey has come to a standstill. Through the kindness of Professor Dumble, I am permitted to publish the paper in the Proceedings of the United States National Museum.

[2] Third Ann. Rept. Geol. Survey of Texas, p. 227, 1891.

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Triassic. Some of these fragments were described by Meek as Unios,[1] but they were in such bad condition that even a generic determination could hardly be considered certain. As the shells on which this paper is based are, I believe, undoubted Unios, and as it seems to be pretty well established that the strata in which they were found are Triassic, I think I need have little hesitation in saying that these are the earliest authentic specimens known of this common and widely distributed genus. I may further add that in the opinion of Dr. Charles A. White[2] it is quite probable that the Gallinas Creek fossils belong to the Jurassic.

Taken as a whole, these Unios closely resemble in form and are apparently nearly related to those of the Jurassic beds of North America, and to certain species of our Cretaceous and Tertiary formations. They can hardly be said to be very near relatives of any species at present living in the New World, though *Unio anodontoides* and one or two other allied species from the Mississippi basin have characters in common with some of them. In Europe, however, the well-known *Unio pictorum* and other somewhat similar species, as well as most of the forms found in Asia Minor, show a considerable resemblance to some of these species.

It is remarkable that there has been so little change in the species of this genus from the time when they lived in this great Triassic lake to the present day. In some cases specific descriptions of these fossils, whose age probably dates back well toward the beginning of the Mesozoic, so far as all the characters which remain are concerned, would apply almost without change to species living in the Euro-Asiatic region to-day. And Dr. White has shown that the same persistency of characters is true of a number of the forms of the Laramie group of the Cretaceous, which in all probability are the ancestors of some of our characteristic recent Mississippi Valley species, and which can hardly be separated from them.[3]

As he has pertinently remarked, these earliest types of Unios have continued almost unchanged until the present, while to-day there is not a single family of vertebrates in existence that lived in Triassic times. This wonderful persistence of *Unio* forms, and the variety of characters displayed in the species herein described, go to show that the genus must have been well established at the time the Dockum beds were deposited, and that it undoubtedly had its origin at a much earlier period, thus tending to overthrow the theory of Neumayr,[4] that the Unionidæ were derived from the genus *Trigonia*, which probably does not date back to a period earlier than that of the shells under consideration.

[1] *Unio cristonensis*, Meek, Ann. Rept. Expl. and Surv. West of One Hundredth Meridian, 1875, p. 83.

[2] A Review of the Non-marine Fossil Mollusca of North America, p. 425, 1883.

[3] A Review of the Non-marine Fossil Mollusca of North America, p. 428, 1883.

[4] Sitzungsber. d. k. Akad. Wiss. Wien, Math.-naturwiss. Cl., XCVIII, 1889, Heft 1–3, 1. Abth., p. 5.

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The theory advanced by W. Amalsky,[1] that the Naiades descended from the Anthracosidæ, seems the more reasonable one, as the two families agree in many essential points of shell structure, and the latter were probably inhabitants of the fresh waters of the Carboniferous and Permian periods.

Fig. 1.
UNIO SUBPLANATUS, NEW SPECIES.
Internal view of right valve.

UNIO SUBPLANATUS, new species.

Shell rather large, somewhat triangular and compressed; growth lines strong and elevated; dorsal region and posterior slope rounded; beaks not very prominent; area of the lateral teeth strongly curved; cardinals rather wide, parallel, separated by a narrow socket. Length, 85 mm.; height, 57 mm.; diameter, 25 mm.

Locality.—Duck Creek, Dickens County, Texas.

Of this fine species only a single cast of a right valve of ferruginous clay conglomerate, and what is probably a right valve of the same, badly incrusted and buried in a limestone matrix, were received. The latter, on being carefully cleaned, shows the shell to have been of moderate thickness, and to have the curious, parallel, cardinal teeth that characterize most of the Unios of the southern hemisphere to-day. The lateral teeth are shown plainly at their posterior end, but the hinge plate is so worn away and injured that they are not visible along the rest of it.

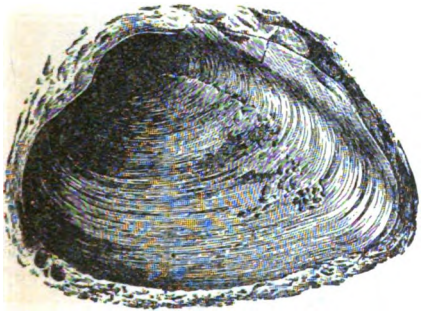

Fig. 2.
UNIO SUBPLANATUS, NEW SPECIES.
Cast from outside of right valve.

UNIO DUMBLEI, new species.

Shell elongated oval, widest at the region of the beaks, rounded before and behind; anterior end very short; posterior and anterior slopes elevated and almost ridgelike, with a flattened or slightly excavated area in the middle of the disc; dorsal margin rounded; base of the shell nearly straight or sometimes a little emarginate; beaks rather prominent; ligament small, but elongated; growth lines rather strong. Length, 55 mm.; height, 25 mm.; diameter, 18 mm.

[1] Paleontographica, XXXIX, p. 198, Stuttgart, 1892.

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Locality.—Five miles northeast of Dockum, head of Duck Creek, Dickens County. Five pairs, more or less perfect, were sent from a gray sandstone near Dockum, and what are probably three or four heavily incrusted valves of the same, from clayey conglomerate from Duck Creek. They resemble quite strongly young specimens of *Unio dignatus* from Assyria, and *U. pictorum* and the allied simple forms of Europe.

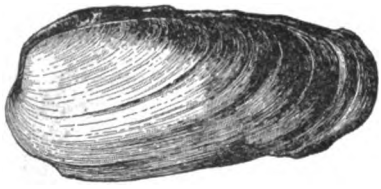

Fig. 3.
UNIO DUMBLEI, NEW SPECIES.

UNIO GRACILIRATUS, new species.

Shell small, oblong oval, rounded before and slightly biangular behind; dorsal region more curved than the base; growth lines moderate; surface generally, but especially the posterior region, more or or less sculptured with delicate, somewhat broken, and wavy narrow liræ. Length, 40 mm.; height, 23 mm.; diameter, 16 mm.

Locality.—South of spur, Headquarters 21, Dickens County, Texas; head of Duck Creek, Dickens County. Four left valves in a limestone matrix were sent from the former locality, and two left valves embedded in coarse granulated limestone from the latter. One right valve of what is probably this species was sent from the Dockum beds, at the southeast corner of Crosby County, Texas, with a number of *U. dockumensis*. Six rather imperfect specimens from the Dockum beds, in the southeast corner of Garza County, Texas, I am inclined to refer to this species, though they are less elongated and nearly all of them destitute of the peculiar sculpture of the type. In some of the specimens of this species, the liræ are quite distinct and regularly developed; in others the surface is nearly smooth; while others show slight, somewhat elongated radiating nodules.

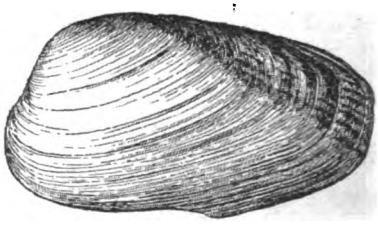

Fig. 4.
UNIO GRACILIRATUS, NEW SPECIES.

UNIO DOCKUMENSIS, new species.

Shell, oblong-oval, rounded before, somewhat pointed posteriorly; umbonal region quite prominent, sculptured with distinct, radiating ridges; sides rather flattened; ventral line straight or slightly incurved about the middle of the shell; ventral region rather prominent posteriorly; growth lines strong; valves solid; pallial line deeply impressed; interior bearing a ridge running diagonally from the cardinals toward the posterior basal portion, in front of which the shell is much thicker; cardinal teeth short and rather stout, laterals solid. Length, 60 mm.; height, 35 mm.; diameter, 25 mm.

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Some of the specimens are considerably smaller than the above measurements, a few are a little larger, and a number seem to have been somewhat distorted by pressure. Specimens which I believe to be females are fuller in the posterior part of the ventral region than others which may be males. Two casts were found the first year in which collections were made from the Staked Plains, at a windmill three miles north of Dockum, and the name *dockumensis* was applied to these by Mr. Cummins, though he did not describe the species. On making clay casts of some of the valves sent, I was convinced that these types were the same as the more perfect specimens, and I have accordingly described the species from some of the latter.

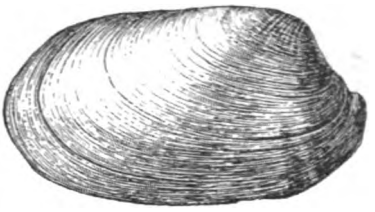

Fig. 5.
UNIO DOCKUMENSIS, NEW SPECIES.

Locality.—Southeast corner of Garza County, Texas; windmill 3 miles north of Dockum; tank north of Double Mountain River; head of Duck Creek, Dickens County, Texas.

An abundant and well-distributed as well as quite variable species, of which a large number of examples were sent, generally in fair condition, and composed for the most part of crystallized calcium carbonate.

In form, the species very strongly resembles the European and western Asiatic Unios of to-day, but it is remarkable in being sculptured with strong, radiating ridges on the umbonal area—a character possessed by all the recent South American species, and somewhat imperfectly by those of Australasia. The teeth, however, are very different from the teeth of these southern forms, and more nearly resemble those of the North American Jurassic and Cretaceous Unios.

Specimens of what are perhaps two other species were sent, but they are not sufficiently well preserved to describe.

To sum up, then, these Triassic Unios are evidently not the earliest members of the genus, since they show divergent characters, which are dominant in widely distributed and prominent groups of this genus found living at the present day. Thus *Unio graciliratus* in its somewhat broken and radiating lines possesses characters now found in an assemblage of peculiarly sculptured species of eastern Asia, and the teeth of *U. subplanatus* have characters like those of all or nearly all the species of the southern hemisphere. The radial beak sculpture is unknown at the present day outside of South America and Australasia, while the forms of at least three of these species, as well as their interiors, where exhibited, bring to mind most strongly the species which now inhabit Europe and western Asia, and a small group belonging to the Mississippi area.

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REVISION OF THE NORTH AMERICAN EMPIDÆ—A FAMILY OF TWO-WINGED INSECTS.

By D. W. COQUILLETT,
Honorary Custodian of the Collection of Diptera.

THE PRESENT paper, which is entirely preliminary in its character, is based upon a study of the rich material contained in the collection of the United States National Museum, supplemented by my own collection and the specimens received from several correspondents, notably from Dr. W. A. Nason, of Algonquin, Illinois; Annie Trumbull Slosson, of New York City; Mr. Charles Robertson, of Carlinville, Illinois, and Prof. Howard Evarts Weed, of Agricultural College, Mississippi. I desire in this place to thank all of those who by the gift or loan of specimens or in other ways have aided in the preparation of this paper, and especially the authorities of the United States National Museum, for the privilege of studying the fine series of specimens in the collection of that institution. Types of the new species, not previously possessed by the Museum, have been deposited with it.

With all this material before me, however, there are still several species of which I have seen no representative, and in the tables which accompany this paper I have in several instances been compelled to make use of only those characters mentioned in the existing descriptions. These tables, despite these imperfections, have been very useful to me in identifying the species, and they are given in the hope that other students may find them equally helpful. Only those genera in which new species are herewith described are tabulated in the present paper, which deals only with the North American forms.

In Osten Sacken's Catalogue of the Described Diptera of North America, twenty-four genera of Empidæ are credited to our fauna. The following observations on some of them may not be out of place here:

Tachydromia.—The species catalogued under this genus belong to *Platypalpus.*

Tachypeza.—The species placed under this genus belong to *Tachydromia.* Macquart restricted the latter name to the present group and applied the name *Platypalpus* to the preceding group three years before Meigen proposed the name *Tachypeza* for the present group; consequently Macquart's name, being the earlier, must be retained. This

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course has already been adopted by Dr. Schiner and the British entomologists.

Synamphotera.—This genus is not as yet known to occur in our fauna; in the single species, *S. bicolor*, referred to it by Loew, the third vein is simple, and not forked; judging from the description, this species apparently belongs to the genus *Sciodromia*, Haliday, not heretofore reported as occurring in our fauna.

Hemerodromia.—The species catalogued under this name are very heterogeneous, and in the present paper they are separated into three genera, viz: *Mantipeza*, Rondani, *Hemerodromia*, Meigen, and a new genus for which the name of *Neoplasta* is proposed. I have followed Rondani in restricting the genus *Hemerodromia* to those forms in which the discal cell is united with one of the other cells, since this author appears to have been the first to dismember the old genus.

Since the publication of the above-mentioned catalogue, three new genera of Empidæ have been proposed, viz, *Mythicomyia*, described by the writer,[1] and *Enoplempis* and *Megacyttarus*, published by Bigot.[2] *Enoplempis* was known to the author in the male sex only. Specimens of what is evidently the species described by him as *Enoplempis cinerea*[3] were collected by the writer in southern California. The females do not differ in any respect from typical species of *Empis*, and therefore should not be separated from it. Both Loew and Schiner have described under *Empis* forms structurally identical with *Enoplempis*.

The genus *Megacittarus*, Bigot, was founded on a single female specimen without antennæ; this is evidently the female of *Rhamphomyia limbata*, Loew, specimens of which are in the National Museum collection from the same locality (Colorado) as the type of *Megacittarus*, and were evidently from the same collector (Morrison). As the male of *R. limbata* does not differ in any respect from a typical *Rhamphomyia*, this proposed new genus must be regarded as being synonymous with the latter.

In the following pages four new genera are established, viz: *Neoplasta*, *Empimorpha*, *Euhybus* and *Neocota;* and two or three genera not heretofore known to occur in our fauna have been recognized, viz: *Mantipeza*, Rondani, *Sciodromia*, Haliday (probably), and *Meghyperus*, Loew.

The genus *Hilarimorpha*, Schiner, has by some authors been placed in the present family, but it has much more affinity with the Leptidæ, to which family it has already been referred by Osten Sacken. Besides the analogies mentioned by this author as existing between *Hilarimorpha* and the other genera of Leptidæ,[4] may be mentioned as a common character the entire eyes, as opposed to the eyes deeply emarginate opposite the antennæ, as they are in the Empidæ.

[1] Entomological News, IV, June, 1893, p. 209.

[2] Bulletin des Séances de la Société Entomologique de France, 1880, p. 47.

[3] Loc. cit., 1882, p. 91.

[4] Berliner Entomol. Zeitschrift, 1890, XXXV, p. 303.

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The following table contains all the genera of Empidæ at present known to occur in North America:

ANALYTICAL KEY TO THE NORTH AMERICAN GENERA OF EMPIDÆ.

1. Third longitudinal vein forked 2
   Third longitudinal vein simple, not forked 16
2. Discal cell present, complete 4
   Discal cell united with one of the other cells 3
3. With only two veins issuing from the discal cell, the anterior one forked *Hemerodromia* (p. 391).
   With three veins issuing from the discal cell, the anterior one simple, not forked ..... *Neoplasta* (p. 392).
4. Three veins issue from apex of discal cell 5
   Two veins issue from discal cell, fourth vein forked, proboscis perpendicular *Mantipeza* (p. 392).
5. Anterior branch of the third vein terminates in the costa (except in some species of *Empis*) 6
   Anterior branch of the third vein terminates in the second vein; anal cell as long as the second basal, the vein at its apex perpendicular to hind margin of the wing ..... *Blepharoprocta.*
6. Proboscis shorter or but slightly longer than height of head 7
   Proboscis much longer than height of head; vein at apex of anal cell nearly parallel with the hind margin of the wing 12
7. Vein closing the anal cell nearly perpendicular to the hind margin of the wing 8
   Vein closing the anal cell nearly parallel with the hind margin of the wing. 9
8. Anterior branch of third vein connected with the second by a cross vein; veins 2 and 3 undulating; wings dotted over their entire surface *Ardoptera.*
   Anterior branch of third vein not connected with the second; veins never undulating; wings not dotted over their entire surface; alulæ well developed ..... *Brachystoma* (p. 393).
9. Antennæ three jointed 10
   Antennæ one-fifth as long as the head, apparently only two jointed, last joint oval; style thick, nearly half as long as the antennæ; proboscis very short ..... *Hormopeza.*
10. Antennal style nearly twice as long as the third joint; proboscis soft, much shorter than the head 11
    Antennal style scarcely longer or shorter than the third joint; proboscis usually rigid ..... *Hilara* (p. 394).
11. Alulæ well developed ..... *Gloma.*
    Alulæ very small ..... *Clinocera.*
12. Proboscis directed downward or backward 13
    Proboscis directed forward; arista of antennæ very short ..... *Iteaphila.*
13. Face naked 14
    Face clothed with bristly hairs ..... *Empimorpha* (p. 396).
14. Hind legs longer than the others, hind femora scarcely or not at all thickened 15
    Hind legs not longer than the others, hind femora greatly thickened, eyes in both sexes widely separated ..... *Pachymeria.*
15. Proboscis not or scarcely longer than height of head ..... *Hilara* (p. 394).
    Proboscis considerably longer than height of head ..... *Empis* (p. 397).

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16. Anal cell present, sixth vein never wholly wanting 17
Anal cell wholly wanting, only the vein at its apex sometimes present, sixth vein wholly wanting, discal cell united with one of the other cells 31
17. Discal cell present, complete 18
Discal cell united with one of the other cells 30
18. Three veins issue from the discal cell, fourth vein always simple, never forked 19
Two veins issue from the discal cell 23
19. Vein at apex of anal cell nearly parallel with the hind margin of the wing, anal cell much shorter than the second basal 20
Vein at apex of anal cell not parallel with the hind margin of the wing, anal cell almost as long as or longer than the second basal cell 22
20. Proboscis as long as or longer than height of head, antennæ distinctly three jointed 21
Proboscis shorter than height of head, antennæ apparently two jointed *Microphorus* (p. 409).
21. Face naked ..... *Rhamphomyia* (p. 409).
Face clothed with bristly hairs ..... *Neocota* (p. 434).
22. Second vein terminates in the costa, anal cell closed far from the wing margin ..... *Sciodromia*.
Second vein terminates in the first, anal cell reaches the wing margin *Mythicomyia* (p. 409).
23. Fourth vein simple, not forked 24
Fourth vein forked, anal cell as long as or longer than the second basal, the vein at its apex nearly perpendicular to the hind margin of the wing ..... *Meghyperus* (p. 435).
24. Vein at apex of anal cell nearly perpendicular to the hind margin of the wing 25
Vein at apex of anal cell nearly parallel with the hind margin of the wing Some females of *Rhamphomyia* (p. 409).
25. Antennal arista apical 26
Antennal arista subdorsal, third antennal joint oval, anal cell shorter than the second basal ..... *Ocydromia*.
26. Anal cell as long as or longer than the second basal 27
Anal cell shorter than the second basal, origin of second vein from the first nearer to the humeral than to the small cross vein. *Leptopeza* (p. 435).
27. Origin of the second vein nearer the small cross vein than to the humeral, or midway between them 28
Origin of the second vein nearer the humeral than to the small cross vein *Syneches* (p. 436).
28. Vein between first and second basal cells present 29
Vein between first and second basal cells wanting ..... *Syndyas*.
29. Eyes in both sexes widely separated on the face, under side of first two joints of hind tarsi bearing short black spines ..... *Hybos* (p. 437).
Eyes in both sexes contiguous on the face, under side of hind tarsi destitute of stout black spines ..... *Euhybus* (p. 437).
30. Middle femora slender, vein at apex of anal cell nearly parallel with the hind margin of the wing ..... *Cyrtoma*.
Middle femora greatly thickened, vein at apex of anal cell nearly perpendicular to the hind margin of the wing ..... *Platypalpus* (p. 438).
31. Antennal arista apical 32
Antennal arista dorsal or subdorsal 33
32. Front femora thickened ..... *Tachydromia* (p. 439).
Front femora not thickened ..... *Drapetis*.
33. Palpi broad, front of an equal breadth ..... *Stilpon*.
Palpi narrow, elongate ..... *Phoneutisca*.

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Genus HEMERODROMIA, Meigen.

The occurrence in North America of *H. precatoria*, Meigen, rests on Walker's authority, and will require verifying before being accepted. Our species are brought together in the following table:

ANALYTICAL KEY TO THE SPECIES OF HEMERODROMIA

Anal cell, or at least the cross vein at its apex, present.
Thorax and abdomen yellow ..... *defecta.*
Thorax and abdomen black ..... *albipes.*

Anal cell wholly absent.
1. Thorax, or at least the pleura and sternum, red or yellowish 2
Thorax wholly black, no large tubercle on underside of front femora near the base ..... *captus* (p. 391).
2. With a medio-dorsal black vitta on the thorax, front femora destitute of a large tubercle on the under side near the base ..... *empiformis.*
With two black dorsal vittæ on the thorax, front femora bearing a large, spine-tipped tubercle on the under side near the base ..... *superstitiosa.*
With no black vitta on the thorax, front femora as in the preceding species *rogatoris* (p. 392).

HEMERODROMIA CAPTUS, new species.

Male.—Head black, white pollinose, depressed; antennæ and proboscis light yellow; proboscis rigid, slightly shorter than height of head, projecting obliquely backward; first antennal joint one-half as long as the second, the third two and a half times as long as the second and one and a half times as broad, broadly oval but tapering to the apex, the apical third styliform; upper side of third joint short pilose; style robust, one-third as long as the third joint; eyes bare, widely separated. Thorax, scutellum, metanotum, pleura, and sternum black, opaque grayish pollinose, bristles of thorax and of scutellum microscopic. Abdomen brownish black, the sides narrowly, front corners of each segment and the venter, yellow. Legs, including the coxæ, light yellow, front femora not longer than the coxæ, greatly thickened, nearly three times as thick as the tibiæ, with small teeth below, as has also the tibiæ. Base of front femora destitute of a tubercle on the inner side beyond apex of the folded tibiæ, the spine at this point springing directly from the surface. Wings hyaline, stigma wanting, as are also the discal and anal cells; second basal cell exceeding the first by about twice the length of the cross vein at apex of the second; upper fork of fourth vein about equaling the length of the penultimate section of that vein. Halteres light yellow.

Type.—No. 3151, U.S.N.M.; length, 2 to 3 mm. Five specimens in the National Museum collection.

Locality.—New York.

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HEMERODROMIA ROGATORIS, new species.

The male differs from *H. captus* as follows: Thorax, scutellum, metanotum, pleura, and sternum light red. Abdomen in middle of dorsum brownish red, the seventh segment wholly light yellow; hypopygium large, projecting both above and below the abdomen, reddish brown. Middle and hind coxæ light red; on the under side of each front femur near its base, and just beyond the tip of the folded tibia, is a rather large blunt tubercle, bearing at its summit a stout spine directed obliquely forward.

Type.—No. 3152, U.S.N.M.; length, 4 mm. A single specimen.

Locality.—North Carolina.

NEOPLASTA, new genus.

Head somewhat depressed, eyes widely separated in both sexes; antennæ much shorter than the head, three jointed, third joint oval, slightly longer than broad, pointed at the apex, thickly short pilose; style apical, robust, much shorter than the third joint; proboscis projecting downward, subequal in length to height of head; palpi small, nearly cylindrical. Front coxæ two-thirds as long as the front femora, the latter nearly twice as thick as the other femora, which are slender; none of the tibiæ armed with a stout spur at the tip. Wings with the third vein forked, the discal cell present and sending three veins to the wing margin; second basal cell united with the discal, anal cell present, the vein at its apex nearly perpendicular to the hind margin of the wing.

Type.—Hemerodromia scapularis, Loew, in the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

Genus MANTIPEZA, Rondani.

ANALYTICAL KEY TO THE SPECIES OF MANTIPEZA.

1. Thorax largely yellow, abdomen and venter partly yellow..... 2
   Thorax and abdomen wholly ash-gray, stigma of wings yellowish brown..*valida.*
2. Lateral margins of thorax black, scutellum blackish 3
   Lateral margins of thorax yellowish, scutellum light yellow.....*palloris* (p. 392).
3. Thorax with a medio-dorsal black vitta, stigma of wings round, black .....*notata.*
   Thorax destitute of such a vitta, stigma very pale yellowish, scarcely visible *obsoleta.*

Loew's three species of this genus were originally described under *Hemerodromia.*

MANTIPEZA PALLORIS, new species.

Male and female.—Head, black; face, cheeks, and lower part of front nearly to the lowest ocellus, yellow, densely white pollinose; antennæ, proboscis, and palpi, light yellow. Thorax reddish yellow, marked with two slightly darker vittæ and with a whitish stripe between them;

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pleura reddish yellow; scutellum light yellow, bearing two long apical and two much shorter lateral bristles; metanotum reddish brown; abdomen yellow, with a medio dorsal, indistinct brownish vitta; legs and halteres yellow; wings hyaline; stigma wanting.

Types.—Nos. 3153 and 3154, U.S.N.M.; length, 4 to 5 mm. Three males and one female.

Locality.—New Hampshire.

Genus BRACHYSTOMA, Meigen.

The species described by Loew belong to *Blepharoprocta*, a genus which he founded for their reception.

BRACHYSTOMA ROBERTSONII, new species.

Male.—Head black, gray pollinose; eyes separated as widely as the upper ocelli, facets of a uniform size; face naked, scarcely one-half as wide as the front; antennæ yellow, the third joint except at base, and the style, brown; first joint shorter than the second, the third lanceolate, scarcely twice as long as broad, twice as long as the second; style terminal, curved, one-third longer than the third joint; proboscis yellow, thick, perpendicular, nearly two-thirds as long as height of head; palpi whitish, perpendicular. Thorax very shining black; pleura blackish, opaque light gray pollinose; metanotum and scutellum the same, the latter bearing two bristles; no pile in front of halteres. Abdomen compressed, shining yellowish, a large dorsal blackish-brown spot on each segment; hypopygium large, ascending, each upper lamella produced at the outer angles into a pair of long, erect, cylindrical, brown processes; middle lamellæ very large, each bearing at its tip a rather large curved process, in front of which is a small, pilose tubercle, while behind it is a smaller tubercle bearing a few long whitish bristles; the inner side of each middle lamella bears a long, cylindrical, brown-tipped process; filament slender, arcuate, proceeding from apex of the rather large lower lamella. Legs, including the coxæ, yellow; front coxæ not one-half as long as their femora; front and hind femora slender, the middle greatly thickened, nearly twice as thick as the front ones; their under sides thickly beset with very short black spines and with longer black bristles; inner side of middle tibiæ also thickly beset with very short black spines; hind femora bearing a black bristle on front side before the apex, a similar one on outer side of hind tibiæ near the base; all metatarsi nearly equally slender, the hind ones one-third longer than the others. Knob of halteres yellow. Wings nearly hyaline, stigma wanting, first basal cell slightly longer than the anal, which is a trifle longer than the second basal.

Type—No. 3155, U.S.N.M.; length, 4 mm. Received by the author from Mr. Charles Robertson.

Locality.—Illinois.

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Genus HILARA, Meigen.

ANALYTICAL KEY TO THE SPECIES OF HILARA.

1. Thorax black 3
   Thorax, femora, and halteres yellow 2
   Thorax and abdomen metallic green ..... *viridis* (p. 395).
2. Tarsi wholly brown, pile on inner side of middle tibiæ long ..... *testacea*.
   Tarsi brown only at apex, elsewhere yellow, pile on inner side of middle tibiæ short ..... *lutea*.
3. Femora black 10
   Femora yellowish 4
4. Knob of halteres yellowish 6
   Knob of halteres black 5
5. Wings darker at apex than toward the base, scutellum bearing six bristles; length, 5 mm ..... *umbrosa*.
   Wings not darker at apex than elsewhere, scutellum bearing only four bristles; length, 3 mm ..... *gracilis*.
   Wings gray; length of body, 2 mm ..... *migrata*.
6. Abdomen wholly black 7
   Abdomen on basal half yellow, palpi yellow, stigma blackish brown ..... *basalis*.
7. Posterior legs and the stigma blackish ..... *plebeja*.
   Posterior legs largely or wholly yellow 8
8. Palpi yellow, stigma blackish 9
   Palpi black, stigma obsolete ..... *macroptera*.
9. Pile of thorax in rows, front metatarsi thickened, ovate ..... *scriata*.
   Pile not in rows, front metatarsi not thickened, antennæ of male eight times as long as the head ..... *johnsoni* (p. 395).
10. Knob of halteres black 12
    Knob of halteres yellowish, palpi black 11
11. Stigma brownish black, knees yellow ..... *trivittata*.
    Stigma obsolete, knees whitish ..... *leucoptera*.
12. Stigma brownish black 13
    Stigma obsolete, palpi black, front femora in both sexes very thick, knees, tips of front tibiæ and their tarsi yellow ..... *femorata*.
13. Thorax grayish-black, never velvety 14
    Thorax and head velvet black, scutellum and abdomen shining, palpi black, coxæ and legs wholly black ..... *velutina*.
14. Abdomen shining or subshining 17
    Abdomen opaque, palpi, coxæ, and legs, excepting the knees, wholly black .. 15
15. Front velvet black, wings blackish ..... *tristis*.
    Front grayish, not velvety; wings hyaline or pale grayish 16
16. Pile of abdomen largely yellowish, thorax marked with three blackish vittæ *cana* (p. 395).
    Pile of abdomen black, thorax not vittate ..... *unicolor*.
17. Palpi yellow 19
    Palpi black, coxæ and legs, excepting the knees, black 18
18. Thorax shining, not vittate ..... *atra*.
    Thorax opaque gray pollinose, marked with three black vittæ ..... *mutabilis*.
19. Front coxæ and base of front femora yellow, wings pale grayish ..... *nigriventris*.
    Front coxæ and base of femora black, wings hyaline ..... *brevipila*.

Hilara transfuga, Walker, is too imperfectly described to admit of giving it a place in this table.

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HILARA JOHNSONI, new species.

Male and female.—Black; the palpi, halteres, coxæ, femora and tibiæ yellow. Eyes of male separated over twice the width of the lowest ocellus. Head, thorax, and scutellum opaque gray pollinose, that on the thorax somewhat yellowish, their short pile and bristles black; scutellum bearing four bristles; abdomen subshining, its pile rather long, black. Wings hyaline, stigma dark brown. Proboscis of male slightly over one-half as long as, in the female fully as long as, height of head. Antennæ of female three times as long as the head, but in the male excessively long, being fully eight times as long as the head, the third joint five times as long as the first, the style three-fourths as long as the third joint and *coiled spirally toward its tip*, a character not occurring in any other Empid known to me.

Types.—Nos. 3156 and 3157, U.S.N.M. Three males and one female; length, 3.5 to 4 mm. Collected by Mr. C. W. Johnson, of Philadelphia, Pennsylvania, after whom I take pleasure in naming this remarkable species.

Locality.—Eufaula, Alabama.

HILARA CANA, new species.

Male.—Wholly black, including the palpi and knees. Head opaque, gray pollinose, the pile black. First two antennal joints subequal in length, the third three times as long as the second, style nearly as long as the third joint. Proboscis as long as height of head. Eyes widely separated. Thorax opaque gray pollinose, marked with three brownish-black vittæ, pile and bristles black; pleura naked. Scutellum bearing four black bristles. Abdomen and hypopygium opaque gray pollinose, the pile largely yellowish. Legs bearing rather long scattered pile, none of the femora unusually robust, front tibiæ more robust than the middle ones, front metatarsi greatly enlarged. Wings hyaline, stigma grayish-black.

Female.—Like the male, except that the front tibiæ are not thicker than the middle ones, and the front metatarsi are not enlarged.

Types.—Nos. 3158 and 3159, U.S.N.M.; length, 3 to 4 mm. Twelve males and seven females collected by the writer in February and March.

Locality.—Southern California.

HILARA VIRIDIS, new species.

Male.—Shining metallic green, the pleura largely black, antennæ, proboscis, hypopygium, and legs yellowish brown; eyes separated width of lower ocellus; proboscis slightly shorter than height of head; halteres black; pile and bristles of entire body black; scutellum bearing only two bristles; wings hyaline, veins yellowish, anterior branch of third vein perpendicular to that vein.

Type.—No. 3160, U.S.N.M., a single specimen; length, 2.5 mm. Collected by Mr. T. D. A. Cockerell, November 3, 1892.

Locality.—Kingston, Jamaica, West Indies.

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EMPIMORPHA, new genus.

Same as *Empis*, except that the face is covered with long bristly hairs; antennal style apical, proboscis directed downward, longer than height of head; third vein forked; discal cell perfect, sending three veins to the wing margin; anal cell shorter than the second basal, the vein at its apex nearly parallel with the hind margin of the wing.

Type.—*Empimorpha comantis*, new species, described below.

Two species, both from California, occur in our fauna.

ANALYTICAL KEY TO THE SPECIES OF EMPIMORPHA.

Wings brown, costal cell reddish, pile in front of halteres and on sides of abdomen black ..... *barbata.*

Wings, including the costal cell, hyaline or grayish, pile in front of halteres and on sides of abdomen whitish..... *comantis.*

EMPIMORPHA COMANTIS, new species.

Male.—Head black, gray pollinose; pile of face mixed black and white; eyes narrowly separated, the space between them being narrower than width of lowest ocellus, the upper facets noticeably larger than the lower ones; antennæ black, the second joint reddish, slightly over one-third as long as the first; third joint subequal with the first, twice as long as broad; style slender, as long as the third joint; proboscis two and one-half times as long as height of head, projecting obliquely downward and backward; palpi slender, curving upward, yellowish, the base brown, the pile black and white. Thorax black, shining, three vittæ and the broad lateral margins opaque gray pollinose; pile of thorax very abundant, whitish, two longitudinal stripes of largely black pile on the dorsum; pleura black, gray pollinose, its pile whitish. Scutellum black, thickly whitish pilose, destitute of stout bristles. Abdomen shining black, depressed, twice as long as wide; its pile very abundant, on the first two segments and sides of the others largely whitish, on dorsum of remaining segments mostly black; hypopygium small, central filament hidden except at base. Legs rather robust, reddish yellow; coxæ, under side of each femur, apex of each tibia, and of each tarsal joint, blackish; legs simple, the pile abundant. Knob of halteres black. Wings hyaline, grayish toward the apex; veins, stigma, and a spot above furcation of second and third veins, dark brown.

Female.—Same as the male, except that the first abdominal segment and the bases of the second and third are opaque gray pollinose.

Types.—Nos. 3161 and 3162, U.S.N.M.; length, 11 mm. A male and female were received from Mr. Charles Fuchs, of San Francisco, California.

Locality.—Northern California.

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Genus EMPIS, Linnæus.

As stated on a preceding page, *Enoplempis mira*, Bigot, and *E. cinerea*, Bigot, both belong to *Empis*. However, as the name *Empis cinerea* is preoccupied for a European species, Bigot's description of *E. cinerea* should be canceled.

Empis geniculata, Kirby, is evidently a synonym of *E. luctuosa*, Kirby.

Empis sociabilis, Williston, is described in the Kansas University Quarterly.[1]

Empis agasthus, Walker, is too imperfectly described to be admitted in the table given below; it is from Hudsons Bay; is black, the halteres and legs yellowish, apices of femora, of tibiæ, and of tarsi blackish, the wings colorless; length, 3 mm.

ANALYTICAL KEY TO THE SPECIES OF EMPIS.

1. Thorax, including the pleura, wholly black 16
   Thorax, or at least the pleura, and also the femora, largely or wholly yellowish 2
2. Knob of halteres yellowish 3
   Knob of halteres blackish, head black, thorax with a medio-dorsal black vitta ..... *leptogastra.*
3. Thorax yellowish, marked with four or five blackish vittæ 4
   Thorax not vittate, or with a medio-dorsal vitta, or the entire dorsum grayish black 8
4. Head grayish black 5
   Head and abdomen yellow; hind femora black vittate, and in the male furnished with teeth-like processes on the under side near the apex; hind tibiæ furnished with similar processes near the base ..... *mira.*
5. Abdomen, except sometimes at apex, wholly black, coxæ black 6
   Abdomen yellow, base of each segment blackish, coxæ yellow, femora not vittate, hind femora and tibiæ of male simple ..... *sordida.*
6. Front and middle femora black vittate, antennæ yellow except at tip, proboscis as long as the thorax ..... *eudamides.*
   Front and middle femora destitute of black vittæ 7
7. Proboscis shorter than the body, antennæ wholly black, dorsum of thorax never grayish, wings brownish ..... *ollius.*
   Proboscis nearly as long as the body, first two joints of antennæ yellowish, dorsum of thorax grayish, wings hyaline ..... *abcirus.*
8. Head yellowish 9
   Head blackish 12
9. Abdomen yellowish, unmarked 10
   Abdomen blackish, sides and hind margin of each segment yellow, eyes of male separated, hind legs furnished with teeth-like processes ..... *armipes.*
10. First two joints of antennæ yellow; length, 4 mm 11
    First two joints of antennæ black; length, 6 mm ..... *colonica.*
11. Anterior branch of third vein connected with the second by a cross vein, all cross veins bordered with brown ..... *pæciloptera.*
    Anterior branch not connected with the second vein, cross veins not bordered ..... *pallida.*

[1] Vol. II, p. 76 (1893).

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12. Abdomen, except sometimes the sides, wholly blackish; antennæ black 14
Abdomen yellowish; apex of each segment, and sometimes a median vitta, blackish; dorsum of thorax grayish black 13
Abdomen and thorax yellow, unmarked; eyes of male subcontiguous; filament of hypopygium free, slender, arcuate ..... *rufescens.*
13. Abdomen with a medio-dorsal black vitta, first two joints of antennæ black, pleura unmarked ..... *longipes.*
Abdomen destitute of a medio-dorsal vitta, first two joints of antennæ yellow, pleura marked with black, scutellum bearing four bristles ..... *humile* (p. 403).
14. Sides of thorax and of venter not thickly pilose 15
Sides of thorax and of venter covered with long, abundant yellow pile. *lanirentris.*
15. Tibiæ wholly yellow, hind legs simple ..... *amylis.*
Tibia black on apical part, hind femora near the apex and hind tibiæ near the base furnished with teeth-like processes in the male; eyes widely separated, scutellum bearing two bristles ..... *loripedis* (p. 400).
16. Femora black or very dark brown 42
Femora largely or wholly yellowish 17
17. Knob of halteres yellowish 22
Knob of halteres blackish 18
18. Front and middle coxæ black 19
Front and middle coxæ yellow, anterior branch of third vein usually ending in the second, eyes of male contiguous, filament of hypopygium slender, hidden except on basal part; both sides of each femur and tibia, and upper side of front and hind metatarsi in the female ciliate with scales ..... *clausa* (p. 401).
19. Pile of abdomen black, sparse; that of thorax sparse 20
Pile on sides of abdomen white, abundant, thorax thickly pilose, scutellum pilose and bearing twelve marginal bristles, hind femora twice as thick as their tibiæ, antennal style as long as the third joint.. *comantis* (p. 402).
20. Palpi yellow; length, 7 to 9 mm 21
Palpi black, apices of tibiæ blackish, wings brownish, eyes of male contiguous, filament of hypopygium hidden; length, 4 mm ..... *spiloptera.*
21. Scutellum bearing ten marginal bristles, abdomen on first four segments opaque gray pollinose, wings hyaline ..... *valentis* (p. 402).
Scutellum bearing only four bristles, abdomen shining, wings brownish gray, eyes of male separated, filament of hypopygium filiform.. *humile* (p. 403).
22. Wings hyaline or grayish 24
Wings brown 23
23. Antennal style almost one-half as long as the broad third joint, eyes of male widely separated ..... *tenebrosa* (p. 404).
Antennal style less than one-fourth as long as the elongated third joint, eyes of male contiguous ..... *spectabilis.*
24. Abdomen black or dark brownish 27
Abdomen yellowish, sometimes marked with black 25
25. Dorsum of abdomen not marked with black in the middle 26
Dorsum of abdomen more or less black in the middle, eyes of male widely separated, filament of hypopygium very thick at base, then suddenly attenuated; length, 6½ mm ..... *loripedis* (p. 400).
26. With a long bristle on costa near its base, pile of abdomen black, stigma distinct; length, 6 mm ..... *tersa* (p. 404).
Without such a bristle, pile of abdomen whitish, stigma wanting; length, 3½ mm ..... *compta* (p. 405).
27. Pile in front of halteres black 30
Pile in front of halteres whitish; length, 6 to 7 mm 28

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28. Scutellum bearing at least six bristles, under side of apical half of hind femora of female ciliate with scales ..... *varida* (p. 403).
Scutellum bearing only two bristles, both sides of middle and hind femora and tibiæ of female ciliate with scales ..... *captus* (p. 405).
Scutellum bearing four bristles, legs of female not ciliate 29
29. Wings grayish, stigma distinct ..... *avida* (p. 405).
Wings whitish, stigma wanting ..... *levicula* (p. 406).
30. Males 31
Females 36
31. Filament of hypopygium free, at least on lower half 32
Filament hidden, eyes widely separated; hind femora on under side near the tip, and hind tibiæ near the base, bearing teeth-like processes ... *poplitea*.
32. Hind femora near the tip and hind tibiæ near the base destitute of teeth-like processes 33
Hind femora and tibiæ bearing such processes, eyes separated .... *manca* (p. 406).
33. Abdomen shining 34
Abdomen opaque, eyes widely separated, hind trochanters produced at apex and ciliate with black spines; filament of hypopygium unusually thick at base 35
34. Front coxæ black, eyes widely separated, scutellum bearing four bristles, wing veins brown; length, 5 mm.; antennal style one-third as long as the third joint ..... *otiosa* (p. 407).
Front coxæ black, veins brown, antennal style over one-half as long as third joint ..... *humile* (p. 403).
Front coxæ yellow, wing veins white; length, 3 mm ..... *varipes*.
Front coxæ brown, scutellum bearing only two bristles, all femora not furnished with black spines on the under side, wing veins blackish; length, 4 mm ..... *distans*.
35. Hypopygium with a backwardly curving, lunate process on its under side, wings pure hyaline, pollen of abdomen light gray ..... *reciproca*.
Hypopygium destitute of such a process, wings grayish, pollen of abdomen brownish ..... *nuda*.
36. Abdomen opaque 38
Abdomen shining 37
37. Front coxæ yellow; length, 3½ mm ..... *varipes*.
Front coxæ black; length, 6 mm ..... *otiosa* (p. 407).
38. Costa destitute of a long bristle near its base 39
Costa bearing such a bristle, which equals the second joint of the front tarsi in length; front and hind metatarsi subequal in length .... *manca* (p. 406).
39. Metatarsi yellowish 40
Metatarsi black, pollen of abdomen brownish ..... *nuda*.
40. Third antennal joint slender, elongate 41
Third joint broad, short, scarcely twice as long as the style; second segment of abdomen bearing a fringe of long black bristles toward the sides near the hind margin ..... *gulosa* (p. 408).
41. Eastern species (New Hampshire) ..... *reciproca*.
Western species (Colorado to Alaska) ..... *poplitea*.
42. Knob of halteres blackish 55
Knob of halteres yellowish 43
43. Males 44
Females 50
44. Eyes contiguous, or nearly so 46
Eyes distinctly separated 45
45. Legs very slender, filament of hypopygium hidden, abdomen opaque; length, 4 mm ..... *stenoptera*.
Legs very robust, filament free, abdomen shining, the last segment destitute of white pollen ..... *otiosa* (p. 407).

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46. Venter destitute of a bristly process in front of the hypopygium 47
Venter furnished with two curved, black, bristly processes in front of the hypopygium; filament of the latter hidden; length, over 6 mm..*lævigata.*
Venter with a single large process bristly at the posterior end; thorax subopaque gray pollinose, with three subshining black vittæ..*virgata* (p. 408).
47. Wings brownish; length, 3½ mm 48
Wings hyaline 49
48. Anterior branch of third vein straight and nearly perpendicular, fourth vein not reaching the wing margin..... *labiata.*
Anterior branch very oblique, filament of hypopygium very thick..... *obesa.*
49. Fourth vein reaches the wing margin; anterior branch of the third vein curved and very oblique, scutellum bearing four bristles; length, 5 to 6 mm ..... *sociabilis.*
Fourth vein reaches the wing margin, scutellum bearing six or more bristles; length, 6 to 8 mm..... *ravida* (p. 403).
Fourth vein not reaching the wing margin; anterior branch of third vein straight and nearly perpendicular; length, nearly 4 mm..... *distans.*
50. Posterior femora not ciliate with scales 52
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EMPIS LORIPEDIS, new species.

Male.—Head black, gray pollinose; eyes separated as widely as the posterior ocelli, facets of a uniform size; antennæ black, third joint somewhat over twice as long as the first, slender, tapering gradually to the middle, thence of an equal breadth; style nearly one-third as long as the third joint; proboscis one and one-half times as long as height of head, palpi yellow. Thorax black, opaque gray pollinose, marked with

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four dark-brownish vittæ, almost destitute of pile, the bristles black; pleura black, sometimes partly yellowish, bluish gray pollinose, pile in front of halteres black; scutellum black, gray pollinose, bearing two bristles. Abdomen compressed, shining, black; the broad hind margin of each segment laterally yellow, sometimes extending to the anterior edges of the segment, dividing the black color into three vittæ, medio-dorsal and lateral; pile of abdomen sparse, black; venter yellow; hypopygium rather large, ascending, abundant black pilose, middle lamellæ yellow, broadening to the tip; filament very thick at base, then suddenly attenuated and bristle-like, arcuate. Legs, including the coxæ, light yellow; apical half of front tibiæ and extreme apex of the others, front tarsi wholly, apex of first two joints and the whole of the remaining joints on the middle and hind tarsi, usually but not always dark brown; all tibiæ and tarsi furnished with numerous long black pile; on the under side of each hind femur before its apex is an irregular, three-pronged process, and on the inner side of each hind tibia near its base are two processes, one behind the other; just before the basal process the tibia is hollowed out; front metatarsi nearly twice as long and three times as thick as the middle ones, hind metatarsi one-half thicker and one-third longer than the middle ones. Knob of halteres light yellow. Wings dark gray, stigma slightly darker, veins dark brown.

Female.—Like the male, except that the hind femora and tibiæ are destitute of processes, the front metatarsi are not thicker than the middle ones, while the hind metatarsi are much thicker than and fully as long as the front ones; abdomen tapering to the apex.

Types.—Nos. 3163 and 3164, U.S.N.M.; length, 6 to 7 mm. Five males and five females were received from Mr. Charles Robertson and Prof. H. E. Weed.

Locality.—Illinois and Ohio.

EMPIS CLAUSA, new species.

Male.—Head black, subshining, eyes contiguous, upper facets much larger than the lower ones; antennæ black, the third joint quite short, rather broad at base; style two-thirds as long as the third joint; proboscis two and one-half to four times as long as height of head, palpi brown. Thorax, pleura, and scutellum black, opaque, gray pollinose, pile in front of halteres black; scutellum bearing two bristles. Abdomen black, subshining, toward the base more or less tinged with yellowish, its pile black; hypopygium very small, porrect; filament slender, yellow, hidden except on basal half. Legs simple, slender, the middle and hind femora and all the tibiæ furnished with many very long black pile; coxæ yellow, the hind ones brown; femora yellow, the hind ones, except at base, blackish; tibiæ and tarsi blackish, extreme base of each tibia yellowish; hind tibiæ greatly dilated toward the tip, bowing inward at the middle; front metatarsi nearly twice as thick as the

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middle ones, hind metatarsi nearly as thick and slightly longer than the front ones. Knob of halteres blackish. Wings hyaline, stigma and a broad border to the anterior branch of the third vein and on the small and the posterior cross veins, dark brown; veins brown, fourth vein obliterated before reaching the wing margin, anterior branch of third vein usually ending in the second vein, closing the first submarginal cell; contact of discal and fourth posterior cells much longer than that of the third and fourth posterior cells.

Female.—Differs from the male in that the legs are wholly brown, compressed, and the upper and under sides of all the femora, outer and inner sides of all the tibiæ, and upper sides of the front and hind metatarsi, ciliate with long, nearly erect scales. Base of abdomen never tinged with yellow.

Types.—Nos. 3165 and 3166, U.S.N.M.; length, 4 mm. Five males and five females captured by Mr. Charles Robertson.

Locality.—Illinois.

EMPIS COMANTIS, new species.

Male.—Black; apex of palpi, proboscis except the base and the lower lip, femora except a large portion of the under side, tibiæ and tarsi except at apex, yellowish red. First antennal joint twice as long as the second; the third, one and a half times as long as the first; style slender, as long as the third joint; frontal triangle naked; eyes narrowly separated; proboscis three times as long as height of head. Thorax opaque gray pollinose, marked with four blackish vittæ, thickly white and black pilose, the bristles black; pile on each end of pleura, on coxæ and abdomen, mixed black and white; that on venter and sides of abdomen abundant, white. Scutellum white pilose and bearing twelve marginal black bristles. Abdomen shining, nearly destitute of pollen; hypopygium large, ascending; central filament largely yellow, double, free, arcuate. Legs simple, femora thickened, the hind ones over twice as thick as their tibiæ; pile and bristles of femora rather numerous and long. Wings slightly brownish, stigma and a spot above base of second vein, dark brown, anterior branch of third vein very oblique and much curved.

Type.—No. 3167, U.S.N.M.; length, 9 mm. Male, collected by Mr. O. T. Baron.

Locality.—Northern California.

EMPIS VALENTIS, new species.

Female.—Differs from *E. comantis* as follows: Femora entirely yellowish, apices of tibiæ and whole of tarsi black, third antennal joint twice as long as the first, style less than one-half as long as the third joint. Pile of thorax sparse, black; on each end of pleura, coxæ, abdomen, and venter wholly black; on venter and sides of abdomen very short and sparse. Scutellum destitute of white pile, naked except for the

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ten marginal bristles. Abdomen opaque, light gray pollinose, hind margins of the fifth and sixth, and the following segments, wholly shining. Femora not thickened, the hind ones scarcely thicker than their tibiæ; pile and bristles of femora minute. Wings hyaline, anterior branch of third vein straight and nearly perpendicular.

Type.—No. 3168, U.S.N.M.; female; length, 9 mm.

Locality.—Northern California.

EMPIS HUMILE, new species.

Male.—Head black, gray pollinose except on oral margin; eyes separated a less distance than width of the lowest ocellus, facets of a uniform size; antennæ having the two basal joints brownish yellow, the third black, rather narrow, gradually tapering to the tip, style over one-half as long as the third joint; proboscis from two to three times as long as height of head, palpi light yellow. Thorax, pleura, and scutellum black, opaque grayish pollinose, the rather long pile of thorax and pleura black; thorax with two blackish vittæ, scutellum bearing four bristles. Abdomen black, shining, the pile rather long and abundant, black; hypopygium large, lamellæ largely yellow, middle ones oblong, slightly tapering to the tip, not longer than the broad upper ones; filament slender, almost bristle-like, arcuate. Legs simple, rather robust; coxæ black, femora brownish-yellow, lighter yellow at the base, tibiæ and tarsi light yellow, tarsi brownish toward apex; middle and hind legs provided with rather long, stout, black bristles; front and hind metatarsi subequal in size, the middle metatarsi considerably slenderer and only two-thirds as long as either of these. Knob of halteres yellow. Wings brownish-gray, costal cell and border to some of the veins yellowish; stigma and veins dark brown.

Female.—Same as the male, with these exceptions: Prothorax, the lateral margins of the thorax, the scutellum, metanotum, pleura and abdomen yellowish, a black spot above the middle and hind coxæ, a transverse one on lower part of the metanotum and sometimes a brownish fascia near or on the hind margin of each abdominal segment except the first. Coxæ and legs yellow, hind metatarsi much thicker than the front ones.

Types.—Nos. 3169 and 3170, U.S.N.M.; length, 7 mm. Four males and four females were collected by Mr. Charles Robertson, who writes me that he has repeatedly taken these two forms together "on the same flowers," and believes that they are the opposite sexes of the same species.

Locality.—Illinois.

EMPIS RAVIDA, new species.

Male.—Black, the palpi and halteres yellow, the proboscis (except the lower lip), hypopygium, coxæ (largely or wholly), femora, tibiæ, and tarsi, reddish yellow. Eyes contiguous, frontal triangle bare.

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First antennal joint two and a half times as long as the second, the third joint one and a half times as long as the first, sublanceolate, the style rather slender, nearly half as long as the third joint. Proboscis twice as long as height of head. Thorax opaque, gray pollinose, marked with four brownish black vittæ, the shorter pile whitish, the longer pile and bristles black. Pile on each end of pleura, on coxæ, venter, and sides of abdomen whitish; middle and hind coxæ bearing black bristles. Scutellum bearing from six to eight black bristles. Abdomen opaque, white pollinose, the short pile of the dorsum black. Hypopygium moderately large, obliquely ascending, the central filament not disengaged; no projections on venter in front of hypopygium; coxæ and legs simple, femora destitute of stout spines below, the bristles very short; wings dark gray, stigma very elongated, dark brown, anterior branch of third vein oblique and curved.

Female.—Same as the male with these exceptions: Eyes widely separated; abdominal segments beyond the fifth, shining; apical half of under side of hind femora ciliate with rather short scales and spines.

Types.—Nos. 3171 and 3172, U.S.N.M.; length, 6 to 8 mm. Eleven males and four females in the Museum collection.

Locality.—New Hampshire.

EMPIS TENEBROSA, new species.

Male.—Differs from the female of *E. ravida* only as follows: Eyes as widely separated as the posterior ocelli. First two antennal joints reddish, the first scarcely longer than the second, the third twice as long as the first. Entire pile of thorax, pleura, coxæ, venter and abdomen, black. All femora robust, twice as thick as their tibiæ, the middle and hind ones bearing numerous, rather long bristles on their under side.

Type.—No. 3173, U.S.N.M.; length, 6 mm. Three males in the Museum collection.

Locality.—Texas.

EMPIS TERSA, new species.

Male.—Differs from the male of *E. ravida* only as follows: Abdomen shining reddish yellow; coxæ, femora, and tibiæ lighter yellowish; first antennal joint twice as long as the second, the third joint twice as long as the first; proboscis three times as long as height of head; thorax destitute of whitish pile, that at each end of the pleura black, each coxæ bearing several black bristles; pile and long bristles of abdomen and venter wholly black. Scutellum bearing four bristles. Abdomen shining, destitute of pollen. Hypopygium small, porrect; the central filament free, filiform, arcuate. Bristles of middle and hind femora rather long.

Female.—Differs from the male in that the proboscis is six times as long as height of head, when bent backward almost reaching the tip of the abdomen.

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Types.—Nos. 3174 and 3175, U.S.N.M.; male and female; length, 6 mm.
Locality.—North Carolina.

EMPIS CAPTUS, new species.

Male.—Differs from the male of *E. ravida* only as follows: First two antennal joints reddish; first joint only slightly longer than the second, the third three times as long as the first, tapering very gradually to the apex; scutellum bearing only two bristles; dorsum of abdomen brownish pollinose. Hypopygium very large, the filament robust, disengaged, arcuate, compressed and dilated near its apex; on base of upper side of each upper lamella is a low wart-like process, and just outside of this is a backwardly projecting fleshy process bearing on the middle of its under side a backwardly directed black spine, whose tip is even with that of the process from which it springs; below this process is a second, yellow, fleshy, upwardly directed process. Wings hyaline.

Female.—Differs from the male in that the proboscis varies from two to four times as long as height of head; femora and tibiæ of middle and hind legs ciliate on each side with rather short black scales and bristles, the scales sparsest on the middle tibiæ.

Types.—Nos. 3176 and 3177, U.S.N.M.; length, 5 to 7 mm. Three males and four females in the Museum collection.

Locality.—North Carolina and Georgia.

EMPIS COMPTA, new species.

Female.—Head black, gray pollinose; antennæ on two basal joints brown, the third black, narrow, elongate, style one-sixth as long as the third joint; proboscis over twice as long as height of head, palpi brown. Thorax and pleura black, opaque, gray pollinose, thorax marked with four blackish-brown vittæ; pile in front of halteres black; scutellum blackish, its apex brown, bearing four bristles. Abdomen on base of segments yellowish-brown, on apex broadly light yellow, seventh and eighth segments and the two anal lamellæ, wholly brown; pile of abdomen sparse, yellowish, no fringe of long black bristles near hind margin of any of the segments. Legs slender, destitute of a fringe of scales, yellow, including the coxæ; tarsi toward the apex brown; metatarsi of nearly an equal thickness, the hind ones slightly longer than the others. Knob of halteres light yellow. Wings hyaline, stigma wanting, veins light brown, no stout bristle on costa near its base (first submarginal cell closed in one wing, broadly open in the other).

Type.—No. 3178, U.S.N.M.; length, 3½ mm. A female received from Mr. Charles Robertson.

Locality.—Illinois.

EMPIS AVIDA, new species.

Female.—Head black, bluish gray pollinose; antennæ brown on the two basal joints, the third black, short, broad, tapering gradually to the tip, style over one-half as long as the third joint; proboscis three

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times as long as height of head, palpi yellow. Thorax, pleura and scutellum black, opaque, bluish-gray pollinose; thorax marked with four blackish-brown vittæ, its pile rather numerous but quite short, black; pile in front of halteres white, abundant, fine; scutellum bearing four bristles. Abdomen black, opaque, light bluish-gray pollinose, its pile white, that on sides near base rather long and abundant; no fringe of long black bristles near hind margin of any of the segments. Legs slender, simple, femora destitute of long bristles; coxæ brownish yellow, the hind ones largely blackish; femora, tibiæ, and tarsi brownish-yellow, apices of tarsal joints and last joint wholly blackish; middle metatarsi scarcely thicker than the front ones, hind metatarsi nearly twice as thick but scarcely longer than the front ones. Knob of halteres yellowish-white. Wings grayish hyaline, stigma and veins dark brown, no long bristle on costa near its base.

Type.—No. 3179, U.S.N.M.; length, 7 mm. A single female collected by Mr. Charles Robertson.

Locality.—Illinois.

EMPIS LEVICULA, new species.

Male.—Head black, bluish gray pollinose, eyes contiguous; antennæ black, the two basal joints yellow, style over one-half as long as the third joint; proboscis yellowish, black at the apex, over three times as long as height of head, palpi yellow. Thorax, pleura, and scutellum black, opaque gray pollinose; thorax with four brown vittæ, its sparse pile and bristles black; pile of pleura white, scutellum bearing four bristles, the two outer ones very short. Abdomen black, opaque brown pollinose, its sparse pile white; hypopygium small, the filament hidden. Legs slender, destitute of long bristles, dark yellowish, including the coxæ; the tarsi toward the apex black; front metatarsi nearly as long, but only about one-half as thick as the hind ones. Wings whitish hyaline, veins brownish, stigma wanting. Halteres yellow.

Female.—Same as the male, except that the thorax and abdomen are wholly bluish white pollinose.

Types.—Nos. 3180 and 3181, U.S.N.M.; length, 6 to 7 mm. Two males and three females collected by Mr. Charles Robertson.

Locality.—Illinois.

EMPIS MANCA, new species.

Male.—Head black, gray pollinose, eyes separated the width of the lowest ocellus, facets of a uniform size; antennæ black, third joint narrow, elongate, style one-third as long as the third joint; proboscis one and one-half times as long as height of head, palpi yellow. Thorax black, opaque gray pollinose, marked with four black pollinose vittæ, its sparse pile and bristles black; pleura black, light gray pollinose, its pile black; scutellum black, gray pollinose, bearing four black bristles. Abdomen dark brown, hind margin of each segment whitish,

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opaque whitish pollinose, its pile or bristles along hind margins of the segments long, black; hypopygium yellowish brown, very large, erect, its pile black; central filament very robust, arcuate, free except toward the apex, its extreme tip dilated. Legs slender, yellow, including the coxæ; on under side of hind femora before the apex is a low swelling, in front of which is a robust, backwardly directed hook, while between the swelling and the apex of the femur on the inner side is a black conical projection fringed near the base behind with one large and two small teeth-like projections; on the front and also on the hind side of the hind tibiæ near the base is a fringe of short black bristles, below which on the inner side of the tibia is a conical projection, at which point the tibia is rather suddenly bent outward; hind metatarsi slightly thicker, but shorter, than the front ones. Halteres yellow. Wings grayish hyaline, stigma and veins brown, a long bristle on costa near its base.

Female.—Same as the male, except that the front is slightly broader, the abdomen blackish, light gray pollinose, and the hind legs simple, but much thicker than the others.

Types.—Nos. 3182 and 3183, U.S.N.M.; length, 4 to 5 mm. Five males and eight females, taken by the writer in March.

Locality.—Southern California.

EMPIS OTIOSA, new species.

Male.—Head black, gray pollinose, eyes separated as widely as the posterior ocelli, facets of a uniform size; antennæ black, third joint two and one-half times as long as the first, rather narrow, style one-third as long as the third joint; proboscis two and a half times as long as height of head, palpi yellow. Thorax black, opaque gray pollinose, marked with two darker vittæ, its sparse pile and bristles black; pleura black, gray pollinose, its pile black; scutellum gray pollinose, bearing four bristles. Abdomen black, depressed except toward the apex, subshining, its pile rather abundant and long, black; hypopygium rather small, middle lamella longer than the upper, rounded on the lower side; filament slender, arcuate, yellow. Legs simple, very robust, femora nearly twice as thick as their tibiæ, hind femora one-third longer than the middle ones; coxæ black, femora dark brown, yellowish at base and apex, the hind ones sometimes wholly yellowish, tibiæ and tarsi light yellow, apex of the latter brown; front metatarsi unusually large, nearly twice as long and as thick as the middle ones, one-half thicker and one-third longer than the hind metatarsi. Knob of halteres light yellow. Wings hyaline, stigma pale brownish, veins dark brown.

Female.—Same as the male, except that the tibiæ and tarsi are darker, the yellow being replaced with reddish; the femora are usually reddish and are more slender; the hind ones are nearly twice as long as the middle ones; front metatarsi more slender and one-half longer than the middle ones, also more slender and slightly longer than the hind ones; wings brownish gray.

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Types.—Nos. 3184 and 3185, U.S.N.M.; length, 6 to 7 mm. Four males and three females were received from Mrs. A. T. Slosson and Mr. Charles Robertson.

Locality.—Illinois and Connecticut.

EMPIS GULOSA, new species.

Female.—Head black, bluish gray pollinose; antennæ black, third joint broad at base, rapidly tapering to the apex, style slender, more than one-half as long as the third joint; proboscis one-half longer than height of head, palpi brown. Thorax black, opaque gray pollinose, marked with four dark brownish vittæ; its very short, sparse pile black; pleura black, bluish gray pollinose, pile in front of halteres black; scutellum black, gray pollinose, bearing four bristles. Abdomen black, opaque brownish pollinose, that on the hind and lateral margins of the segments light gray: on the hind margins of the first three segments toward the sides is a fringe of rather long black bristles, most developed on the second segment. Legs slender, simple, yellow, including the coxæ; tarsi toward the apex brown; femora destitute of long bristles; middle metatarsi slightly thicker but shorter than the front ones; hind metatarsi much thicker than the middle ones, subequal in length to the front ones. Knob of halteres yellowish-white. Wings grayish, stigma nearly obsolete, veins dark brown, no long bristles on costa near its base.

Type.—No. 3186, U.S.N.M.; length, 7 mm. A single female specimen collected by Mr. Charles Robertson.

Locality.—Illinois.

EMPIS VIRGATA, new species.

Male.—Black in all its parts except the whitish knob of halteres and pulvilli; all pile and bristles also black. Eyes separated by an interval narrower than the lowest ocellus; third joint of antennæ sublanceolate; the style nearly one-fourth as long as that joint. Proboscis slightly over twice as long as height of head. Thorax subshining, lightly gray pollinose and marked with three shining black vittæ; pleura grayish black pollinose; scutellum shining, bare except the six marginal bristles and a few marginal hairs. Abdomen depressed, shining; hypopygium rather small, central filament hidden; on the under side of the fifth segment is a large, ovoid process, extending the entire length of the segment, its posterior end rather thickly beset with short, stout black bristles. Legs slender, front metatarsi one-half thicker and one-half longer than the middle ones, noticeably longer and thicker than the hind ones. Wings pale brown, stigma darker brown, all the veins perfect.

Type.—No. 3187, U.S.N.M.; length, 8 mm. A single specimen collected by Prof. O. B. Johnson.

Locality.—Washington.

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Genus MICROPHORUS, Macquart.

MICROPHORUS RAVIDUS, new species.

Male.—Black, only the halteres whitish. Eyes contiguous, third antennal joint elongate, conical, the apical style slightly longer than the third joint; proboscis nearly perpendicular, from two-thirds as long to as long as height of head. Thorax, pleura, scutellum, and abdomen opaque gray pollinose, the bristles black, scutellum bearing four bristles; hypopygium rather large, bent around against the right side of the abdomen. Wings grayish hyaline, slightly smoky along the veins, stigma and veins brown, no vein issues from the anal cell: this cell is nearly as long as the second basal, the vein at its apex arcuate and not parallel with the hind margin of the wing.

Female.—Eyes broadly separated; abdomen very blunt at apex; otherwise as in the male.

Types.—Nos. 3188 and 3189, U.S.N.M.; length, 2 mm. Nine males and twelve females collected by the writer in March and April.

Locality.—Southern California.

Differs from the description of *Microphorus drapetoides*, Walker (the only other described North American species), by its hyaline instead of dark brown wings.

Genus MYTHICOMYIA, Coquillett.

ANALYTICAL KEY TO THE SPECIES OF MYTHICOMYIA.

Tibiæ, halteres, first vein and second section of costa, yellow ..... *rileyi.*
Tibiæ, except at base, black; upper side of knob of halteres also black, first vein and costa brown ..... *tibialis* (p. 409).

MYTHICOMYIA TIBIALIS, new species.

Male.—Black, the frontal triangle, face, cheeks, humeri, and each hind corner of thorax, whitish; halteres, except upper side of the knob, hypopygium largely, knees and base of hind metatarsi, yellowish. Head, sides of thorax, pleura and scutellum, gray pollinose, abdomen deep velvet black; pile of head and body whitish. Wings wholly hyaline, veins black, the auxiliary and bases of the other veins yellowish. On the under side of the hind metatarsi, before its middle, is a rounded notch, in front of which is a rounded process.

Type.—No. 3190, U.S.N.M.; length, 3½ mm. A single male specimen captured by the writer in July.

Locality.—Los Angeles County, California.

Genus RHAMPHOMYIA, Meigen.

Rhamphomyia crassinervis, Loew, is the other sex of *R. sordida*, Loew; and his *R. ungulata* is the other sex of *R. umbilicata*, Loew.

The following have not been recognized by me, and the descriptions

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are too brief to permit of giving them a place in the accompanying table: *agasicles*, *anaxo*, *cilipes*, *cophas*, *dana*, *daria*, *ecetra*, *ficana*, *flavirostris*, *nigrita*, *scolopacea*, and *tristis*.

Since the publication of Osten Sacken's Catalogue, Bigot[1] has published descriptions of four North American species belonging to the present genus. His *R. morrisoni* appears to be synonymous with *R. rava*, Loew; *R. pachymera*, Bigot, is too imperfectly described to admit it in the table given below; the names *nigrita* and *geniculata*, which he uses for two of his species, are preoccupied, and Bigot's descriptions had therefore better be canceled.

RHAMPHOMYIA RAVA, Loew.

Dr. Loew describes the wings in both sexes of this species as being somewhat reddish brown. In a large series of specimens that I have examined, captured in the same locality, the males agree in all respects with Dr. Loew's description of *R. rava*, but the females invariably have the wings much lighter colored at the base than at the apex. I strongly suspect that Loew founded his description on males of *R. rava* and females of my new species *R. ravida*, which closely resembles *R. rava*, differing chiefly in the male genitalia and the uniformly brown wings of the female.

RHAMPHOMYIA BASALIS, Loew

Dr. Loew describes the female only. The National Museum contains six males and as many females from the White Mountains, New Hampshire, all of them taken by the same collector (Morrison), and evidently belonging to this species. In size, structure of antennæ, and general coloring, the two sexes are alike, but they differ widely in the shape and color of the wings and in the structure of the legs; in the female the wings are unusually broad, brownish, the base hyaline; while in the male they are narrow and wholly hyaline. In the female the legs are destitute of processes and excisions; in the male each hind femur is hollowed out on the under side just before the apex, and before this hollow is a rather large rounded process; each hind tibia is also hollowed out on the inner side at a point opposite that in the femur; thus when the leg is folded, a hollow space is formed between each femur and its tibia; the outer edge of the hollow in the tibia is fringed with flattened setæ.

ANALYTICAL KEY TO THE SPECIES OF RHAMPHOMYIA.

1. Thorax, including the pleura, wholly black 9
   Thorax, or at least the pleura, more or less yellow or reddish 2
2. Dorsum of thorax marked with black 4
   Dorsum of thorax wholly yellowish, destitute of black markings 3

[1] Bull. Soc. Ent. France, 1887, pp. 141–142. Ann. Soc. Ent. France, 1889, pp. 132–134.

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3. Abdomen, tibiæ, and knob of halteres yellow, legs of female ciliate with nearly erect scales ..... *testacea.*
Abdomen, tibiæ, and knob of halteres black ..... *pectoris* (p. 420).
4. Thorax marked with three black vittæ (median and lateral); wings, abdomen and knob of halteres blackish, legs of female not ciliate with scales.. 8
Thorax marked with only one black vitta (median) 5
Thorax marked with two black vittæ, abdomen largely black, legs of female not ciliate with scales ..... *vittata.*
5. Thorax shining 6
Thorax opaque, hypopygium of male scarcely longer than the preceding segment; under side of middle and hind femora of female, and both sides of middle and hind tibiæ, ciliate with scales ..... *colorata* (p. 420).
6. Wings, abdomen and knob of halteres blackish, hypopygium of male erect, nearly one-half as long as the abdomen 7
Wings hyaline, abdomen yellow, hypopygium small, porrect ..... *sellata.*
7. Hypopygium of male bearing a tooth and notch on hind margin of lower lamella; both sides of all femora and tibiæ of female, and upper side of all metatarsi, ciliate with scales ..... *fumosa.*
Hypopygium destitute of a tooth and notch on the lower lamella, both sides of all femora and tibiæ of female, and upper side of only the hind metatarsi, ciliate with scales ..... *longicauda.*
8. Pleura and venter partly blackish; length, 4 mm ..... *pulchra.*
Pleura and venter wholly yellowish; length, 6 mm ..... *glabra.*
9. Femora black or dark brown 49
Femora largely or wholly yellowish 10
10. Middle, or at least the hind coxæ, black or dark brown 11
Middle and hind coxæ yellowish 22
11. Males 12
Females 16
12. Eyes contiguous or nearly so 13
Eyes distinctly separated, abdomen wholly black or brown; knob of halteres whitish; length, 4 to 5 mm 15
13. Central filament of hypopygium free, very flexuous toward the apex 14
Central filament free except at apex, not flexuous nor fractured; middle lamellæ yellow, not produced upward in a long conical process beyond apex of the black upper lamellæ; length, 8 mm ..... *rava* (p. 410).
Central filament hidden except on its lower one-third; abdomen depressed, opaque; middle lamellæ of hypopygium beyond apex of the upper one not produced in a conical process; length, 8 mm ..... *ravida* (p. 418).
14. Abdomen wholly black, shining, central filament not fractured; length, 6 mm ..... *pulla.*
Abdomen more or less yellow, compressed, shining, central filament fractured toward the base, a brown cloud near forking of second and third veins, hind femora thickened; length, 5 mm ..... *rustica.*
15. Hind tibiæ with a large swelling near the base, central filament of hypopygium with a U-shaped flexure near its base; inhabits California *loripedis* (p. 419).
Hind tibiæ destitute of swellings; inhabits Illinois ..... *mutabilis.*
16. Abdomen opaque, knob of halteres yellowish 17
Abdomen shining 18
17. Length, 8½ mm.; antennal style about one-third as long as the third joint, wings brownish ..... *ravida* (p. 418).
Length, 5 mm.; antennal style one-fifth as long as the third joint, wings hyaline ..... *mutabilis.*

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18. Abdomen wholly black or dark brown 19
Abdomen yellowish, at least on hind margins of the segments; hind femora thickened; length, 5 mm.; inhabits New Hampshire ..... *rustica.*
19. Knob of halteres yellowish 20
Knob of halteres and antennæ blackish, hind femora reddish ..... *macilenta.*
20. Inhabits California; two basal joints of antennæ black, base of hind femora yellowish 21
Inhabits the Atlantic States; two basal joints of antennæ yellowish, base of hind femora black ..... *pulla.*
21. Antennal style one-half as long as the third joint, wings brownish *californica* (p. 420).
Antennal style one-fourth as long as the third joint, wings hyaline *loripedis* (p. 419).
22. Males 23
Females 37
23. Eyes contiguous or nearly so 24
Eyes distinctly separated, thorax opaque or only subshining 33
24. Abdomen, at least on the dorsum, black 28
Abdomen yellowish 25
25. Hind femora slender, hind tibiæ and front tarsi, except at apex, yellow 26
Hind femora thickened, pile of thorax black, basal half of hind tibiæ and front tarsi brown; proboscis as long as height of head; length, 5 mm ..... *dimidiata.*
26. Pile and bristles of thorax black, filament of hypopygium very flexuous, middle lamellæ not tapering to the apex, the pile black 27
ile and bristles of thorax yellow, filament not flexuous, middle lamellæ tapering to the apex; length, 3 mm ..... *arcuata* (p. 421).
27. Proboscis scarcely longer than height of head, wings hyaline, facets of eyes of a uniform size; length, 4 mm ..... *debilis.*
Proboscis three times as long as height of head, wings brownish-gray; upper facets much larger than the lower; length, 5 to 7 mm. *amplipedis* (p. 422).
28. Filament of hypopygium free, except sometimes its extreme apex 30
Filament hidden except on its lowest one-half or less 29
29. Thorax and abdomen shining; length, 6 mm ..... *gracilis.*
Thorax and abdomen opaque; middle lamella of hypopygium beyond apex of upper lamella produced in a high, conical process; length, 8 to 10 mm ..... *quinquelineata.*
30. Filament very flexuous toward its apex, not fractured, hind femora slender. 31
Filament slightly undulate but not flexuous, middle lamella beyond tip of upper one produced in a rounded lobe; length, 9 mm ..... *rava* (p. 410).
31. Upper lamella of hypopygium destitute of a fleshy process, abdomen shining. 32
Upper lamella greatly swollen, and below its apex bearing a cylindrical, fleshy, bristly process; thorax and abdomen opaque ..... *tersa* (p. 422).
32. Thorax shining, venter blackish; length, 3 mm ..... *compta* (p. 423).
Thorax opaque, venter yellow, abdomen compressed; length, 4 mm .. *luteiventris.*
33. Filament of hypopygium hidden except its lower part 34
Filament free, very sinuous toward its apex, wings whitish-hyaline, scutellum bearing four bristles; length, 4 mm ..... *candicans.*
34. Abdomen opaque, gray pollinose and long yellow pilose 35
Abdomen shining, depressed, its pile black, palpi yellowish; length, 5 mm. *macilenta.*
35. Wings brownish 36
Wings grayish, third antennal joint narrow, style very short, hind tibiæ bearing very long yellow pile; length, 4 mm ..... *longipennis.*
36. Length. 6 mm.; third antennal joint narrow, style robust, hypopygium small, its filament very thick, femora robust, setulose below ..... *gilvipes.*

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Length, 4 mm.; third antennal joint broad, style minute, hind tibiæ and metatarsi bearing many long pile, hypopygium large, ascending. *liturata.*

37. Abdomen, at least dorsally, black or dark brown 39
Abdomen yellowish, wings brownish 38

38. Proboscis at least three times as long as height of head, under side of middle and hind femora ciliate with scale-like setæ; length, 5 to 7 mm ..... *amplipedis* (p. 422).
Proboscis scarcely exceeding height of head; length, 4 mm ..... *debilis.*

39. Hind legs bearing nearly erect scales, discal and posterior cells normal; length, 4 mm 40
Hind and other legs destitute of such scales 41

40. Middle and hind femora ciliate with scales on the under side, hind tibiæ not ciliate ..... *effera* (p. 427).
Middle and hind femora destitute of scales, both sides of hind tibiæ ciliate, basal third of wings hyaline, the remainder brown ..... *basalis* (p. 410).

41. Discal and posterior cells normal, abdomen not silvery pollinose 43
Discal cell unusually long, sending only two veins to the wing margin; length, 4 mm 42

42. Abdomen silvery white pollinose ..... *liturata.*
Abdomen not silvery pollinose ..... *longipennis.*

43. Wings marked with a black spot in the submarginal and first posterior cells only; thorax shining; length, 6 mm ..... *gracilis.*
Wings with at least the posterior cells blackish brown; thorax opaque 44
Wings destitute of such spots, uniform in coloring; length, 4 to 6 mm 45

44. Brown near apex of wings in the form of a cloud which does not invade the submarginal cell ..... *quinquelineata.*
Brown covers apex of wing, invading the submarginal cell, basal half of wings yellowish gray ..... *rava* (p. 410).
Brown covers apical half of wings, the basal half whitish hyaline; venter yellow; length, 5 mm ..... *nasoni* (p. 423).

45. Venter black 46
Venter partly yellow, pile in front of halteres black, middle and hind tibiæ dark brown ..... *luteiventris.*

46. Thorax opaque 47
Thorax shining, halteres yellow, pile in front of them black, third antennal joint broad at base, hind femora slender; Californian species ..... *californica* (p. 420).

47. Knob of halteres yellowish 48
Knob of halteres dark brown, pile in front of halteres black, third antennal joint linear; hind femora thickened, black setulose below ..... *macilenta.*

48. Wings grayish hyaline, hind femora slender, pile in front of halteres white, third antennal joint broad at the base ..... *americana.*
Wings grayish, veins brown, hind femora thickened, black setulose below, third antennal joint narrow; length, 6 mm ..... *gilvipes.*
Wings whitish, veins except the costa and first vein whitish; length, 4 mm. *candicans.*

49. Wings brown, the base hyaline or yellowish; length, 3 to 5 mm 50
Wings uniformly hyaline or grayish 54
Wings uniformly brown or blackish 107

50. Discal and posterior cells normal 51
Discal cell unusually long, sending only two veins to the wing margin, abdomen silvery pollinose at base; length, 4 mm.; Californian species ..... *amplicella* (p. 431).

51. Knob of halteres yellowish 52
Knob of halteres blackish 53

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52. Inhabits California; both sides of hind femora and tibiæ, under side of middle femora and outer side of middle tibiæ of female, ciliate with nearly erect scales; length, 3 mm ..... *luctuosa.*
Inhabits Nebraska; all femora and tibiæ of female ciliate with scales.. *lærigata.*
Inhabits Illinois; eyes of male contiguous, filament of hypopygium free, slender, not flexuous, pile in front of halteres black, scutellum bearing four bristles ..... *polita.*
Inhabits the Atlantic States; legs of female not ciliate with scales; eyes of male contiguous; filament of hypopygium hidden..... *angustipennis.*
53. Middle and hind femora and hind tibiæ of female ciliate with nearly erect scales; eyes of male contiguous; filament of hypopygium slender, not flexuous; inhabits the Atlantic States..... *brevis.*
Middle and hind tibiæ of male bearing black setæ, filament of hypopygium hidden, eyes of male contiguous; inhabits the Atlantic States.. *pectinata.*
Middle and other legs of females destitute of nearly erect scales; eyes of male contiguous; filament of hypopygium very thick, hidden except at base; inhabits the Atlantic States..... *umbrosa.*
Middle and other femora and tibiæ not ciliate with scales; inhabits California ..... *bifilata* (p. 424).
54. Thorax wholly shining, not pollinose; knob of halteres yellowish; discal cell and veins issuing from it normal; eyes of male contiguous..... 55
Thorax more or less opaque..... 58
55. Filament of male hypopygium hidden, except sometimes on its basal third.. 56
Filament free, slender, not flexuous, upper facets of eyes of male much larger than the lower; his hind metatarsi much thicker than the others; both sides of middle and hind femora and hind tibiæ of female, also outer side of her middle tibiæ, ciliate with nearly erect scales; wings grayish, stigma black; length, 2 mm ..... *nana.*
56. Abdomen shining; length, 3 to 4½ mm..... 57
Abdomen opaque, wings whitish, stigma obsolete, third antennal joint short and broad, style minute; length, 2 mm ..... *pusio.*
57. Scutellum bearing four bristles, pile in front of halteres black, outer side of middle tibiæ of male bearing numerous bristles ..... *minytus.*
Scutellum bearing only two bristles, pile in front of halteres whitish, outer side of middle tibiæ of male bearing only two bristles, both sides of hind femora and under side of middle femora of female ciliate with nearly erect scales ..... *ciliata.*
58. Knob of halteres yellowish 59
Knob of halteres blackish..... 92
59. Discal cell normal 62
Discal cell united with the first and second posterior cells, legs of female destitute of nearly erect scales; pile of body whitish, third antennal joint broad, bases of first two tarsal joints white ..... *incompleta.*
Discal cell prolonged nearly to the wing margin, legs of female not ciliate with scales; length, 3 to 4 mm 60
60. Two veins issue from the discal cell..... 61
Three veins issue from the discal cell, the cross vein at its apex angular, scutellum bearing two bristles ..... *irregularis.*
61. Wings grayish, vein at apex of discal cell sinuous, never angular..... *limbata.*
Wings hyaline at base, the apex dark gray, vein at apex of discal cell angular near its lower end; inhabits California ..... *amplicella* (p.431).
62. Fourth vein reaches the wing margin..... 67
Fourth vein obliterated before reaching the wing margin, legs of female destitute of erect scales; length, 2 to 3 mm..... 63
63. Males..... 64
Females 65

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64. Fourth vein reaches half way from discal cell to the wing margin, wings whitish, eyes narrowly separated ..... *umbilicata.*
Fourth vein reaches less than half way from discal cell to the wing margin, wings hyaline but not whitish, whole of costal vein brown ..... *soccata.*
Fourth vein reaches three-fourths the distance from discal cell to the wing margin, wings whitish, eyes contiguous..... *manca* (p. 427).
65. With a black dot at tip of fourth vein..... 66
Without such a dot; fourth vein reaches three-fourths the distance from discal cell to the wing margin..... *manca* (p. 427).
66. Fourth vein reaches only one-fourth the distance from discal cell to the wing margin, the black dot at its tip small ..... *umbilicata.*
Fourth vein longer, the dot larger ..... *unimaculata.*
67. Males..... 68
Females 82
68. Eyes contiguous or nearly so 69
Eyes distinctly separated, pile of abdomen yellowish 79
69. Filament of hypopygium hidden..... 70
Filament of hypopygium not wholly hidden..... 71
70. Front tibiæ dilated and thickly pilose on inner side; length, 6 mm. *abdita* (p. 430).
Front tibiæ not dilated, pile on inner side very short; scutellum bearing about fourteen bristles; inhabits California; length, 10 mm. *scutellaris* (p. 429).
71. Hind legs destitute of processes 73
Hind femora near apex on under side, and hind tibiæ near base, bearing a rounded process; length, 4 mm..... 72
72. Process on hind femora situated at extreme apex of the femur and opposite a hollow in the hind tibia..... *valga* (p. 428).
Process situated before the apex, and in front of the hollow in the hind tibia..... *basalis* (p. 410).
73. Filament of hypopygium not flexuous 74
Filament very flexuous toward apex, not suddenly thickened at base, abdomen shining; length, 6 mm..... *flexuosa* (p. 433).
74. Base of filament of hypopygium very thick, then suddenly attenuated..... 75
Base of filament not thickened 76
75. Pile of thorax, abdomen, and legs yellowish, filament of hypopygium nearly twice as long as the hind femora; length, 4 mm..... *piligeronis* (p. 432).
Pile of thorax, abdomen, and legs black, abdomen white pollinose; upper lamellæ of hypopygium acute, median ones larger, obtuse; length, 3 mm. ..... *leucoptera.*
76. Palpi black 77
Palpi yellow, under side of seventh abdominal segment prolonged forward in two short processes; abdomen opaque, its pile yellowish; filament of hypopygium thick, hidden at the tip; length, 5 mm..... *rara.*
77. Length, 3 mm.; Eastern species 78
Length, 9 mm.; abdomen shining, its pile black; California species *fimbriata* (p. 429).
78. Thorax opaque, filament of hypopygium very slender ..... *priapulus.*
Thorax subshining, filament rather thick; on each side of lower portion of hypopygium a shining, forwardly directed process; scutellum bearing four bristles, hind metatarsi twice as thick as the others .....*exigua.*
79. Filament of hypopygium free, slender, proboscis scarcely longer than height of head 80
Filament hidden, intercalary vein not united with the fourth vein, penultimate section of fifth vein much longer than the ultimate section; first joint of middle tarsi slender, much longer than the second; length, 4 mm..... *sordida.*
80. Intercalary vein not united with the fourth..... 81
Intercalary vein at base united with the fourth vein; length, 4 mm..*conjuncta.*

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81. Second joint of middle tarsi longer than the first one, each thicker than any of the others; length, 3 mm ..... *frontalis.*
Second joint shorter than the first; neither of them thicker than those of the hind tarsi; length, 5 mm ..... *irregularis.*
82. Femora and tibiæ destitute of erect scales 87
Femora, or at least the under side of the hind ones, ciliate with nearly erect scales 83
83. Middle and hind femora bearing such scales 84
Middle femora destitute of scales, antennal style one-sixth as long as the third joint; length, 2½ mm ..... *parra* (p. 433).
84. Length of body, under 6 mm 85
Length, 9 mm.; scales of legs confined to under side of middle and hind femora; thorax subshining and marked with three deep black vittæ; California species ..... *fimbriata* (p. 429).
85. Middle and hind femora bearing scales on under side only 86
Middle and hind femora ciliate on both sides, antennal style one-fifth as long as the third joint; length, 4½ mm ..... *abdita* (p. 430).
86. Antennal style one-fourth as long as the third joint, tibiæ destitute of scales; inhabits Colorado; length, ¼ mm ..... *effera* (p. 427).
Antennal style one-half as long as the third joint, hind tibiæ bearing nearly erect scales; California species; length, 5½ mm ..... *stylata* (p. 432).
87. Palpi black 88
Palpi yellow, thorax and abdomen opaque, pile of abdomen yellowish; length, 5 mm ..... *rara.*
88. Thorax opaque or nearly so 89
Thorax shining, three vittæ and the sides white pollinose; abdomen shining, its pile yellowish; length, 7 mm ..... *virgata* (p. 430).
89. Antennal style not over one-fifth as long as the third joint 90
Antennal style nearly one-half as long as the third joint; contact of discal and fourth posterior cells much shorter than that of the third and fourth posterior cells; length, 6 mm ..... *flexuosa* (p. 433).
90. Penultimate section of fifth vein much shorter than the ultimate section; front and middle metatarsi subequal in size, much smaller than the hind ones 91
Penultimate section of fifth vein much longer than the ultimate section; length, 4½ mm ..... *sordida.*
91. Thorax opaque, bluish gray pollinose, vein issuing from anal cell distinct, reaching the wing margin; pile in front of halteres whitish; length, 4 mm ..... *frontalis.*
Thorax opaque, gray pollinose, pile in front of halteres black; length, 3 mm. *priapulus.*
Thorax subshining, lightly grayish-black pollinose, vein issuing from anal cell indistinct, not reaching the wing margin; length, 3 mm ..... *exigua.*
92. Males; discal and posterior cells normal 93
Females 102
93. Eyes contiguous or nearly so; length, 3 to 5 mm 94
Eyes distinctly separated 100
94. Filament of hypopygium not flexuous, sometimes hidden 95
Filament flexuous toward apex, not suddenly thickened at base; abdomen densely grayish-white pollinose; length, 3 mm ..... *nigricans.*
95. Posterior metatarsi never globose 96
Posterior metatarsi very thick, globose, wings gray; length, 2½ mm... *impedita.*
96. Abdomen not grayish-white pollinose 97
Abdomen opaque grayish-white pollinose; a long seta issuing from apex of lower lamella of hypopygium (not the usual central filament); Californian species ..... *bifilata* (p. 424).

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97. Thorax wholly opaque gray pollinose 98
Thorax shining, two vittæ and the sides gray pollinose, a long seta (not the central filament) issues from apex of lower lamella of hypopygium; California species ..... *duplicis* (p. 424).
Thorax and abdomen velvet black, filament hidden ..... *expulsa.*
98. Pile of abdomen short, black 99
Pile of abdomen rather long, yellowish; filament of hypopygium bristle-like ..... *arida* (p. 425).
99. Filament of hypopygium suddenly thickened at base; upper lamellæ as broad as long ..... *setosa* (p. 426).
Filament slender, upper lamellæ also slender ..... *clarigera.*
100. Abdomen opaque 101
Abdomen shining, filament of hypopygium very thick at base, third antennal joint slender; length, 5 mm ..... *longicornis.*
101. Hypopygium large, erect, black pilose, upper lamellæ oblong, the median ones broad, third antennal joint broad; length, 4 mm. ..... *limbata.*
Hypopygium subglobose, long yellow pilose; length 3 mm ..... *? hirtipes.*
102. Middle and hind femora on each side bearing nearly erect scales 103
Middle and other legs destitute of scales 104
103. Hind tibiæ on both sides bearing nearly erect scales; inhabits Colorado; length, 3 mm ..... *otiosa* (p. 425).
Hind tibiæ destitute of scales; thorax wholly opaque; inhabits the Atlantic States; length, 4 mm ..... *? hirtipes.*
104. Front metatarsi as long as, and thicker than, the front tibiæ; length, 3¼ mm. *rufirostris.*
Front metatarsi two-thirds as long as, and more slender than, the front tibiæ. 105
105. Antennal style not over one-sixth as long as the third joint, hind tarsi less than twice as thick as the middle ones 106
Antennal style one-fourth as long as the third joint, hind metatarsi nearly three times as thick as the middle ones; California species. *bifilata* (p. 424).
106. Femora wholly blackish, abdomen subopaque black; length, 3 to 4 mm 111
Femora yellow at base, abdomen shining dark brown, not white pollinose; length, 5 mm ..... *longicornis.*
107. Thorax wholly shining, not pollinose, discal and posterior cells normal 108
Thorax more or less opaque and pollinose 112
108. Knob of halteres yellowish 109
Knob of halteres blackish, eyes of male contiguous, filament of hypopygium free at base ..... *luctifera.*
109. Females; some of the legs bearing nearly erect scales 110
Males; legs never bearing scales, eyes contiguous, extreme base of wings whitish, filament of hypopygium slender; length, 3 mm ..... *polita.*
110. Front and other femora and tibiæ bearing nearly erect scales on both sides; length, 4 mm ..... *lævigata.*
Front legs destitute of scales; length, 2½ mm ..... *nana.*
111. Abdomen densely grayish white pollinose ..... *nigricans.*
Abdomen destitute of light colored pollen ..... *expulsa.*
112. Knob of halteres yellowish 113
Knob of halteres blackish, discal and posterior cells normal 118
113. Males; eyes contiguous, discal cell normal, filament of hypopygium hidden toward its apex; length, 8 mm 114
Females 115
114. Antennal style one-half as long as the third joint, proboscis scarcely twice as long as height of head; California species ..... *sudigeronis* (p. 431).
Antennal style one-sixth as long as the third joint, proboscis over three times as long as height of head; Eastern species ..... *umbrosa.*

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115. Vein between discal and second posterior cells distinct 116
Vein between these cells faint or wanting, legs destitute of erect scales, pile of pleura and abdomen whitish; length, 3 mm ..... *aperta.*
116. Hind and other femora destitute of erect scales 117
Hind femora bearing nearly erect scales on the under side, pile of body black; California species; length, 8 mm ..... *sudigeronis* (p. 431).
117. Pile and bristles of thorax, pleura, and abdomen black; legs bearing long bristles; length, 3 mm ..... *phemius.*
Pile and bristles whitish or yellow, legs destitute of long bristles; length, 4½ mm ..... *gilvipilosa* (p. 434).
118. Males; eyes contiguous 119
Females 120
119. Abdomen depressed, filament of hypopygium yellow, free excepting the tip, suddenly narrowed at its first third; length, 3½ mm ..... *insecta* (p. 426).
Abdomen compressed, filament black, hidden, excepting the base; length, 5½ mm ..... *umbrosa.*
120. Hind and middle femora bearing nearly erect scales 121
Hind and other legs destitute of scales 124
121. Front legs destitute of scales 122
Front legs bearing nearly erect scales, third antennal joint broad; length, 6 mm ..... *mallos.*
122. Hind tibiæ bearing nearly erect scales 123
Hind and other tibiæ destitute of scales, abdomen depressed, subopaque; California species; length, 5 mm ..... *duplicis* (p. 424).
123. Middle tibiæ and under side of middle femora bearing nearly erect scales, style of antennæ minute, proboscis slightly longer than height of head, abdomen subshining; length, 4 mm ..... *corvina.*
Middle tibiæ and under side of middle femora destitute of scales, abdomen shining; length, 5 mm ..... *lævigata.*
124. Abdomen depressed, attenuated posteriorly, wings grayish toward apex; length, 3½ mm ..... *insecta* (p. 426).
Abdomen compressed, subtruncated at apex, wings uniformly brown toward the apex; length, 5½ mm ..... *umbrosa.*

RHAMPHOMYIA RAVIDA, new species.

Male.—Head black, grayish-brown pollinose, eyes very narrowly separated, the interval being narrower than the lowest ocellus; facets of nearly a uniform size; antennæ black, the third joint lanceolate; style over one-third as long as the third joint; proboscis slightly longer than the head, palpi dark yellowish. Thorax, pleura, and scutellum black, opaque, grayish brown pollinose; thorax marked with three dark brown vittæ, its pile rather abundant and quite long, whitish, or brown, and black; pile above front coxæ yellowish, that in front of halteres yellowish or black; scutellum bearing about fourteen marginal bristles; abdomen depressed, black, opaque brownish gray pollinose, its pile quite abundant and long, yellowish and black; on each side of the seventh segment is a shining black vitta, marking the division into two parts of the dorsal and ventral portions of this segment, the vittæ being on the lower half; hypopygium rather large, ascending; filament hidden, except the posterior side of its lower third. Coxæ and trochanters black, gray pollinose, sometimes yellowish at apices; femora

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and tibiæ light yellow, hind femora much thicker than the others, the under side beset with stout black spines; tarsi yellowish, toward the apex brown; front and middle metatarsi of an equal size, the hind ones much thicker and almost one-half longer than the others. Knob of halteres yellowish. Wings brownish gray, stigma brown, veins dark brown, fourth vein entire.

Female.—Same as the male, with these exceptions: Front and middle femora darker, more brownish, tibiæ and tarsi brownish. Wings nearly uniform light brown.

Types.—Nos. 3191 and 3192, U.S.N.M.; length, 8 to 9 mm. Five males and one female in the Museum collection.

Locality.—Illinois, Texas, and New Mexico.

RHAMPHOMYIA LORIPEDIS, new species.

Male.—Head black, eyes broadly separated, the interval nearly as broad as the face; antennæ black, first joint twice as long as the second, third joint three times as long as the first, tapering quite rapidly to the middle, then of nearly an equal width; style one-fourth as long as the third joint; proboscis one and a half times as long as height of head, palpi yellow. Thorax black, subshining, lightly gray pollinose, the sparse pile and bristles black; pleura black, gray pollinose, pile in front of halteres white. Scutellum black, bearing four bristles. Abdomen shining blackish brown, its pile long and rather abundant, white; hypopygium rather small, ascending; filament free, very thick on basal half, then abruptly becoming slender and bowed downward in the form of a U, the outer prong of which is prolonged and slightly undulating. Legs yellow, coxæ largely black, hind femora toward the apices, hind tibiæ except at bases, and apices of tarsal joints, brown; hind femora considerably swollen before the apices and on the under side of the apical third bearing stout black bristles; hind tibiæ greatly thickened toward the apices, and on the inner side near the base is a large swelling bearing short black bristles; below this swelling the tibia bends forward and slightly outward; front metatarsi slightly thicker than the middle ones, hind metatarsi slightly thicker but not longer than the front ones. Halteres yellowish white. Wings hyaline, stigma and veins brownish, fourth vein entire.

Female.—Same as the male, with these exceptions: Venter yellow on the fifth and sixth segments, sometimes a yellow spot on sides of the third and fourth. Hind femora scarcely thickened, tibiæ destitute of a swelling near the base; front metatarsi somewhat thicker than the hind ones.

Types.—Nos. 3193 and 3194, U.S.N.M.; length, 4 to 5 mm. Two males and three females, collected by the writer in March and April.

Locality.—Southern California.

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RHAMPHOMYIA CALIFORNICA, new species.

Female.—Head shining black, antennæ black, first joint one and a half times as long as the second, third joint two and a half times as long as the first, on its under side tapering quite rapidly to the middle, then of nearly an equal width; style one-half as long as the third joint; proboscis one and a half times as long as height of head, palpi reddish-yellow. Thorax black, subshining, the pollen very light, sparse pile and bristles black; pleura and scutellum the same, scutellum bearing four bristles. Abdomen shining black, tapering at the tip, its sparse pile black. Legs simple, not squamulate, reddish-yellow, coxæ black, tarsi brownish toward apices, hind metatarsi much thicker and longer than the others, metatarsi less than two-thirds as long as their tibiæ. Halteres yellow, the stalk reddish. Wings uniformly brown, fourth vein entire.

Type.—No. 3195, U.S.N.M.; length, 6 mm. Collected by O. T. Baron.

Locality.—California.

RHAMPHOMYIA PECTORIS, new species.

Male.—Head blackish brown, shining; eyes contiguous, the upper facets very much larger than the lower ones; antennæ brown, first joint twice as long as the second (the third wanting); proboscis slightly longer than height of head, palpi dark brown. Thorax, including the pleura, scutellum, and metanotum, shining dark yellow, unmarked, pile and bristles black, scutellum bearing four bristles. Abdomen shining brownish black, the sixth segment reddish; pile rather long and quite abundant, mostly black; hypopygium small, porrect, central filament slender, arcuate, free; each intermediate lamella bears just above its apex a slender, fleshy, very hairy process, nearly as long as the lamella, projecting backward. Legs simple, dark brown, the coxæ and bases of all the femora yellow, most extended on the front femora; trochanters yellow, a small black spot on apex of each; bases of hind tarsal joints, except the first and last, yellow; metatarsi less than one-half as long as their tibiæ; front and hind metatarsi much thicker than the middle ones. Halteres black. Wings brown, lighter behind the fourth vein, the latter entire.

Type.—No. 3196, U.S.N.M.; length, 5 mm. Collected by Mr. E. A. Schwarz.

Locality.—St. Catherine Island, Georgia.

RHAMPHOMYIA COLORATA, new species.

Male.—Head black, gray pollinose, eyes contiguous, upper facets much larger than the lower ones; antennæ brownish yellow, third joint broad at base, tapering quite rapidly on the under side to the middle, then of nearly an equal width; style one-fourth as long as the third

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joint; proboscis one-half longer than height of head, palpi yellow. Thorax black; the lateral margins, humeri, and prothorax brown, opaque, grayish-brown pollinose; its sparse pile and bristles black; pleura mottled yellowish and dark brown, a black spot above the middle and hind coxæ, pile of pleura black; scutellum black, grayish-brown pollinose, bearing four bristles. Abdomen compressed, brown, lightly white pollinose, subshining, its pile black; hypopygium very small, central filament hidden. Legs slender, simple, the femora and coxæ light yellow, the tibiæ and tarsi brownish; front tibiæ before the middle on the inner sides dilated, and thickly ciliate on the apical two-thirds with short black and brown setæ; front metatarsi considerably thicker and somewhat longer than the middle ones; hind metatarsi thicker and one-third longer than the front ones. Knob of halteres pale yellow. Wings uniformly pale brown, veins and stigma dark brown, fourth vein entire.

Female.—Same as the male, with these exceptions: Abdomen depressed, tapering behind, upper and under sides of the middle and hind femora, outer and inner sides of the middle and hind tibiæ, and inner sides of the front tibiæ, ciliate with nearly erect scales, most developed on the hind legs; front tibiæ not dilated within.

Types.—Nos. 3197 and 3198, U.S.N.M.; length, 5 to 6 mm. Three males and four females in the Museum collection.

Locality.—Texas.

RHAMPHOMYIA ARCUATA, new species.

Male.—Head black, gray pollinose, eyes contiguous, upper facets much larger than the lower ones; antennæ yellowish brown on the two basal joints, the third black, rather broadly lanceolate; style one-third as long as the third joint; proboscis scarcely longer than height of head, palpi dark brown. Thorax and scutellum black, shining, very lightly pollinose, the pile and bristles yellowish; pleura black, the pile whitish; scutellum bearing four bristles. Abdomen brownish yellow, compressed, shining, its pile sparse, yellowish white; hypopygium large, ascending, upper lamellæ large and swollen, the intermediate tapering toward the apex, the lower side rather abundant long yellowish pilose; filament free, very slender, not fractured nor flexuous. Legs slender, simple, light yellow including the coxæ; last tarsal joint brown; front metatarsi considerably thicker and longer than the middle ones, hind metatarsi much thicker and one-fourth longer than the front ones. Knob of halteres yellow. Wings hyaline, stigma obsolete, veins brownish, fourth vein entire.

Type.—No. 3199, U.S.N.M.; one male; length, 3 mm.

Locality.—Massachusetts.

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RHAMPHOMYIA AMPLIPEDIS, new species.

Male.—Head black, gray pollinose except on oral margin, eyes contiguous, upper facets much larger than the lower ones; antennæ yellowish brown on two basal joints, the third black, narrow, very gradually tapering to the apex; style one-fifth as long as the third joint; proboscis three times as long as height of head, palpi dark brown. Thorax, pleura, and scutellum black, opaque, gray pollinose, the pile and bristles black; scutellum bearing four bristles. Abdomen compressed, brownish yellow, shining, its pile black; hypopygium rather large, upper lamellæ not swollen, longer than the middle ones, the latter of nearly an equal width, obliquely truncate at apex, the upper angle prolonged beyond the lower one; lower lamellæ prolonged at each side, each side-piece bending outward near its tip, which is rounded; central filament slender, not fractured, very flexuous toward its apex. Legs slender, the coxæ, femora, and tibiæ dark yellow, tarsi black; front metatarsi thicker and longer than the middle ones, hind metatarsi one-half thicker and one-third longer than the front ones; hind tibiæ at apices as thick as their femora. Knob of halteres yellow. Wings brownish gray, stigma pale brownish, veins dark brown, fourth vein entire.

Female.—Same as the male, except: Proboscis nearly four times as long as height of head; abdomen tapering to the tip; under side of middle and hind femora ciliate with scale-like setæ.

Types.—Nos. 3200 and 3201, U.S.N.M.; length, 5 to 7 mm. Seven males and three females in the Museum collection.

Locality.—Massachusetts.

RHAMPHOMYIA TERSA, new species.

Male.—Head black, bluish-gray pollinose; eyes contiguous, upper facets much larger than the lower ones; antennæ black, first two joints yellowish, the third slender, sublanceolate; style about one-third as long as the third joint; proboscis scarcely longer than height of head; palpi black; thorax, pleura, and scutellum black, opaque, bluish-gray pollinose, the sparse pile and bristles black; scutellum bearing four bristles; abdomen blackish, tinged in places with yellowish, opaque dark gray pollinose; its pile rather long and quite abundant, yellowish; hypopygium rather large, ascending, upper lamellæ considerably swollen, and below apex of each a cylindrical, fleshy, hairy process projecting backward; intermediate lamellæ longer than the others, nearly horizontal, their apices studded with numerous very short black spines; filament slightly thickened at base, then slender and flexuous, not fractured; venter compressed, opaque, yellowish except at apex; legs simple, slender, yellow, including the coxæ; hind femora outwardly, their tibiæ and all the tarsi, yellowish-brown, front metatarsi slightly thicker than the middle ones, not quite so thick, but fully as long, as the hind ones; knob of halteres light yellow; wings hyaline; veins and stigma

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brownish; fourth vein entire; base of costa bearing a black bristle at least twice as long as the adjacent pile.

Type.—No. 3202, U.S.N.M.; one male; length, 5 mm.

Locality.—New Hampshire.

RHAMPHOMYIA COMPTA, new species.

Male.—Head black, eyes contiguous; antennæ dark brown, first joint slightly over twice as long as the second, the third twice as long as the first, tapering quite rapidly near the base, then of nearly an equal width; style one-third as long as the third joint; proboscis slightly exceeding height of head, palpi blackish. Thorax black, wholly shining, its sparse pile and bristles black; pleura brownish black; scutellum black, bearing four bristles. Abdomen, including the venter, shining brownish black, its pile white; hypopygium rather large and greatly expanded below, yellow pilose, central filament slender, free, very flexuous toward its tip. Legs simple, yellow including the coxæ; tarsi brown, metatarsi less than one-half as long as their tibiæ, middle and hind metatarsi thicker than the front ones. Halteres yellow. Wings pure hyaline, the veins and stigma brownish, fourth vein entire.

Type.—No. 3203, U.S.N.M.; one male; length, 3 mm.

Locality.—United States.

RHAMPHOMYIA NASONI, new species.

Female.— Head black, gray pollinose; antennæ yellow, the third joint excepting the under side at the base black, rather broad; the style black, one-fifth as long as the third joint; proboscis yellow, one and one-third times as long as height of head, palpi yellow. Thorax black, opaque brownish gray pollinose, marked with three slender dark brown vittæ, its sparse pile and bristles black; humeri and a streak back of each, yellow; pleura dark brown, bluish gray pollinose, pile in front of the halteres black. Scutellum colored like the thorax, bearing four bristles. Abdomen compressed, opaque dark brown, hind margins of the first six segments, especially on the sides, yellow; venter wholly yellow; the two anal stylets largely yellow. Legs rather slender, light yellow, including the coxæ; tarsi infuscated toward the tips; legs destitute of scales and long hairs. Wings whitish hyaline from base nearly to the apex of the discal cell, from thence to the tip dark brown, marked with a white costal spot beyond the tip of the first vein; veins normal, colorless from the base to the branching of the second and third veins, beyond this brown; last section of the fifth vein one-half longer than the penultimate section.

Type.—No. 3204, U.S.N.M.; length, 5 mm. A single specimen captured May 6, 1894, by Dr. W. A. Nason, after whom I take pleasure in naming this handsome species.

Locality.—Illinois.

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RHAMPHOMYIA DUPLICIS, new species.

Male.—Head black, lightly gray pollinose, eyes contiguous, upper facets much larger than the lower ones; antennæ black, third joint sublanceolate, style one-fourth as long as the third joint; proboscis slightly longer than height of head, palpi black. Thorax black, subshining, except two vittæ and the lateral margins which are gray pollinose; pile rather abundant and long, black; pleura black, opaque dark gray pollinose, its pile black; scutellum black, subshining, bearing six bristles. Abdomen depressed at base, then compressed, black, opaque grayish black pollinose, its pile black; hypopygium small, porrect, upper lamellæ longer than the middle ones, apex of lower lamella bearing a very slender, long, upwardly curving seta; central filament rather thick, hidden except on its basal third. Legs shining black, rather slender, simple; front and middle metatarsi of an equal size, hind metatarsi over twice as thick as, and one-half longer than, the others. Knob of halteres black. Wings gray, stigma and veins dark brown, fourth vein entire.

Female.—Differs from the male as follows: Abdomen depressed, tapering to the apex; middle metatarsi slightly thicker than the front ones; under side of middle and hind femora ciliate with nearly erect scales; wings uniformly grayish brown.

Types.—Nos. 3205 and 3206, U.S.N.M.; length, 4 to 5 mm. Two males and two females captured by the writer in February and March.

Locality.—Southern California.

RHAMPHOMYIA BIFILATA, new species.

Male.—Head black, opaque, gray pollinose, eyes contiguous, upper facets much larger than the lower ones; antennæ black, the third joint contracted on its under side, then of nearly an equal width; style one-fourth as long as the third joint; proboscis nearly one-half longer than height of head, palpi black. Thorax, pleura, and scutellum black, bluish gray pollinose, subopaque; pile black, on the thorax long and rather abundant; scutellum bearing four bristles. Abdomen compressed, black, opaque, grayish-white pollinose, its pile black; hypopygium rather small, porrect; upper lamellæ narrow, slightly longer than the middle ones; the latter broad, obliquely subtruncated at apices, the lower corner produced beyond the upper one, and rounded; a long, slender, upwardly curving seta issuing from apex of lower lamella; central filament rather thick, hidden except on its lower third. Legs black, simple, hind tibiæ greatly thickened on the apical part and densely long black pilose; front and middle metatarsi subequal in size, the hind ones nearly three times as thick and one-fourth longer than the others; all the tibiæ with many long black pile. Knob of halteres black. Wings whitish hyaline, stigma obsolete, veins brown; fourth vein entire.

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Female.—Same as the male, with these exceptions: Abdomen depressed, tapering to the apex, hind tibiæ not thickened at the tips, their pile and that of the other tibiæ rather short; wings brownish gray stigma dark brown.

Types.—Nos. 3207 and 3208, U.S.N.M.; length, 3½ to 4 mm. A male and female captured by the writer in February and March.

Locality.—Southern California.

RHAMPHOMYIA AVIDA, new species.

Male.—Head black, gray pollinose, eyes contiguous, facets of nearly a uniform size; antennæ black, third joint very broad, gradually tapering to apex, style scarcely one-sixth as long as the third joint; proboscis one-fourth longer than height of head, palpi dark brown. Thorax black, opaque, bluish gray pollinose, its pile rather long and quite abundant, mixed yellow and black; pleura black, bluish gray pollinose, its pile yellow; scutellum concolorous with thorax, bearing four black bristles. Abdomen black, opaque, bluish gray pollinose, its pile rather long and quite abundant, yellowish white; hypopygium small, upper lamellæ scarcely half as long as the middle ones, filament bristle-like, arcuate, free on its lower third, issuing from middle of hypopygium. Legs simple, rather stout, blackish brown, furnished with rather long black bristles; front and middle metatarsi subequal in size, the hind ones nearly twice as thick as the others. Knob of halteres yellowish brown. Wings hyaline, stigma and veins brown, fourth vein entire.

Type.—No. 3209, U.S.N.M.; length, 3¼ to 4 mm. Seven males, collected in April and May.

Locality.—Massachusetts.

RHAMPHOMYIA OTIOSA, new species.

Female.—Head black, subshining, lightly brownish pollinose, antennæ black, third joint sublanceolate, style one-third as long as the third joint; proboscis nearly one-half longer than height of head; palpi black. Thorax, pleura, and scutellum black, subshining, very lightly pollinose, the pile and bristles black; scutellum bearing four bristles. Abdomen depressed, dark brown, tapering to the tip, its sparse pile black. Legs robust, dark brown, hind femora and tibiæ compressed, upper and under sides of the middle and hind femora, and the inner and outer sides of the hind tibiæ ciliate with nearly erect scales; middle metatarsi thicker and longer than the front ones, hind metatarsi nearly twice as thick and one-half longer than the middle ones. Knob of halteres blackish, fourth vein entire.

Type.—No. 3210, U.S.N.M.; length, 3 mm. A single specimen.

Locality.—Colorado.

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RHAMPHOMYIA SETOSA, new species.

Male.—Head black, gray pollinose, eyes contiguous, upper facets much larger than the lower ones; antennæ black, third joint rather broad at base, style one-third as long as the third joint; proboscis slightly longer than height of head, palpi black. Thorax black, subshining, its pile long and rather abundant, black; pleura black, gray pollinose, its pile black; scutellum black, gray pollinose, bearing eight bristles. Abdomen black, subshining lightly grayish-black pollinose; its pile long and rather abundant, black; hypopygium rather large, upper lamellæ short, as broad as long, each bearing at its upper angle a backwardly directed hook; middle lamellæ much longer than the upper, long black pilose on lower side, and just before the tip bearing a rather long, downwardly directed process; filament very thick at base, then suddenly attenuated and arcuate, the attenuated portion rather robust. Legs black, simple, rather stout, furnished with many long black pile; front and middle metatarsi nearly equally slender, the hind ones slightly thicker than the others. Knob of halteres black. Wings hyaline, tinged with brown in the basal and anal cells; stigma grayish brown, veins dark brown, entire, costa near the base bearing two long black bristles.

Closely related to *R. nigricans*, Loew, but in that species the filament of the hypopygium is flexuous toward the apex and not suddenly thickened at the base, the wings are whitish and without the brown tinge in the basal and anal cells, the base of the costa bears a single long bristle, and the abdomen is whitish pollinose.

It is also closely related to *R. clavigera*, Loew, which I have not seen, but in that species the upper lamellæ of the hypopygium are described as being slender, instead of very broad, and the filament is said to be very slender, instead of rather robust, and suddenly thickened at the base.

Type.—No. 3211, U.S.N.M.; length, 3½ mm. Four males in the Museum collection.

Locality.—New Hampshire.

RAMPHOMYIA INSECTA, new species.

Male.—Black, including the palpi and halteres, the abdomen and legs tinged with brown; eyes contiguous, upper facets noticeably larger than the lower ones; third antennal joint rather broad, the style one-third as long as this joint; proboscis subequal in length to height of head. Thorax and pleura opaque grayish-brown pollinose, the pile of the former rather abundant and long, black on both thorax and pleura. Scutellum bearing four bristles, besides a few short pile. Abdomen depressed, subshining, its pile rather abundant, that on the dorsum very short, mixed yellowish and black; hypopygium rather large, somewhat

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porrect, upper lamellæ very slender, three times as long as broad, of an equal length with median ones; filament yellow, free, very broad at base, suddenly narrowed to less than half its width at the first third of its under side, then gradually tapering to the apex, not flexuous. Legs slender, simple, thickly but very short pilose; front metatarsi noticeably more slender than the middle ones, hind metatarsi twice as thick but scarcely longer than the middle ones. Wings grayish, stigma pale brownish, veins normal, brown, last section of fifth vein longer than the penultimate section.

Female.—Same as the male, except front and middle metatarsi subequal in size, the hind ones nearly twice as thick as, and slightly longer than, the others.

Type.—No. 3212 and 3213, U.S.N.M.; length, 4 mm. A single male and female in the Museum collection.

Locality.—Texas.

RHAMPHOMYIA EFFERA, new species.

Female.—Head black, gray pollinose; antennæ black, first two joints brown, the third lanceolate; style one-fourth as long as the third joint; proboscis slightly longer than height of head, palpi brown. Thorax, pleura, and scutellum black, gray pollinose, subshining, pile and bristles of thorax mostly black, pile in front of halteres whitish; scutellum bearing four bristles. Abdomen brown, subshining, tapering behind, its pile yellowish. Legs slender, dark brown, base of femora and the coxæ lighter, more brownish yellow; under sides of middle and hind femora ciliate with nearly erect scales, the upper sides ciliate with short setæ; metatarsi of nearly an equal thickness and length. Knob of halteres pale yellow. Wings brownish gray, stigma darker, veins brown, fourth vein entire.

Type.—No. 3214, U.S.N.M.; one female; length, 4 mm.

RHAMPHOMYIA MANCA, new species.

Male.—Head black, bluish-gray pollinose; eyes contiguous, upper facets not larger than the lower; antennæ black, third joint broadly lanceolate, style one-fifth as long as the third joint; proboscis somewhat longer than height of head. Thorax, pleura, scutellum, and abdomen black, opaque bluish-gray pollinose, the pile and bristles whitish; scutellum bearing only two bristles; hypopygium large, ascending, the filament hidden. Legs simple, very dark brown, tarsi white except the last two or three joints and the front metatarsi; front and hind metatarsi subequal in size, slightly thicker than the middle ones, not one-half as long as their tibiæ. Knob of halteres light yellow. Wings whitish, veins concolorous, except the costa beyond apex of first vein; last fourth of ultimate section of the fourth vein obliterated before reaching the wing margin; stigma wanting.

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Female.—Differs from the male as follows: Abdomen very dark brownish, not gray pollinose, subshining, tapering posteriorly. Tarsi brown, base of metatarsi yellowish.

Types.—Nos. 3215 and 3216, U.S.N.M.; length, 2½ mm. Three males and one female in the Museum collection.

Locality.—North Carolina.

RHAMPHOMYIA VALGA, new species.

Male.—Head black, gray pollinose, eyes contiguous, upper facets larger than the lower ones; antennæ dark brown, second joint lighter, the third rather broad, lanceolate; style one-fourth as long as the third joint; proboscis slightly longer than height of head, palpi dark brown. Thorax, pleura, and scutellum black, opaque bluish-gray pollinose, the sparse pile and bristles black; scutellum bearing two bristles. Abdomen black, the basal half mottled yellow and brown, subshining, compressed, its pile rather abundant and long, black; hypopygium small, ascending, the upper lamellæ very small and not swollen; central filament yellow, thick, arcuate, free except at apex; venter yellowish on basal half. Legs brown, extreme base of each tibia yellow; coxæ dark yellow; hind femora much thickened toward the apices, the underside of each just before the tip bearing a rather large rounded process; near its base each hind tibia is hollowed out at a point opposite the process in the femur, so that when the legs are folded up the femoral process fits into the hollow in the tibia; the outer edge of this hollow is not fringed with setæ. Front metatarsi slightly thicker and longer than the middle ones, hind metatarsi considerably thicker but no longer than the front ones. Knob of halteres dark yellow. Wings hyaline, stigma obsolete, veins brown, fourth vein entire.

Type.—No. 3217, U.S.N.M.; one male; length, 4 mm.

Locality.—New Hampshire.

RHAMPHOMYIA CILIATA, new species.

Male.—Head black, face shining, eyes contiguous; antennæ black, third joint sublanceolate, style nearly one-third as long as the third joint; proboscis shorter than height of head, palpi black. Thorax and scutellum shining black and destitute of pollen, pleura and metanotum blackish, opaque gray pollinose; scutellum bearing only two bristles; sparse pile and bristles of thorax, pleura, and scutellum light yellowish. Abdomen shining dark brown, its sparse pile whitish; hypopygium small, ascending, central filament hidden. Legs simple, very dark brown, including the tarsi, extreme bases of tibiæ yellowish; front metatarsi slightly thicker but shorter than the middle ones, hind metatarsi much thicker and longer than the others; lower sides of front metatarsi, of middle femora, and inner sides of middle tibiæ ciliate with short black setæ; on outer side of each middle tibia, near its middle and also near its tip, is a very long bristle. Knob of halteres dull yellowish. Wings hyaline, veins and stigma brownish, fourth vein entire.

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Female.—Differs from the male as follows: Proboscis somewhat longer than height of head. Abdomen tapering to apex. Hind metatarsi scarcely thicker than the front ones; front metatarsi and middle tibiæ not ciliate, no long bristles on outer side of middle tibiæ; middle femora on under sides and hind femora on upper and under sides ciliate with nearly erect scales. Wings grayish.

Types.—Nos. 3218 and 3219, U.S.N.M.; length, 3½ to 4½ mm. One male and two females in the Museum collection.

Locality.—New Hampshire.

RHAMPHOMYIA SCUTELLARIS, new species.

Male.—Head black, gray pollinose, eyes contiguous, upper facets much larger than the lower ones; antennæ black, third joint contracted on the under side near the middle, the terminal portion of nearly an equal width; style more than one-third as long as the third joint; proboscis one-fourth longer than height of head, palpi black. Thorax black, subshining, lightly grayish brown pollinose and marked with three black vittæ, pile rather abundant and long, black; pleura black, opaque grayish brown pollinose, its pile black; scutellum black, subshining, lightly grayish brown pollinose, bearing fourteen bristles. Abdomen depressed, black, subshining, lightly gray pollinose; its pile black, hind margins of segments 2 to 6 pale yellow; hypopygium small, porrect, lower lamellæ curving upward and pointed at apices, central filament hidden except at extreme base. Legs black, rather slender, simple; front metatarsi slightly thicker and longer than the middle ones, hind metatarsi much thicker and one third longer than the front ones. Knob of halteres pale yellow. Wings dark gray, somewhat brownish along the veins, stigma and veins dark brown, fourth vein entire.

Type.—No. 3220, U.S.N.M.; length, 11 mm. A single male taken by the writer.

Locality.—Northern California.

RHAMPHOMYIA FIMBRIATA, new species.

Male.—Head black, brownish gray pollinose except on oral margin, eyes contiguous, upper facets much larger than the lower ones; antennæ black, the third joint broad, gradually tapering to the apex, style one-half as long as the third joint; proboscis one-third longer than height of head, palpi black. Thorax subshining, lightly brownish pollinose, almost brassy, and marked with three black vittæ, its pile and bristles black; pleura black, subopaque, gray and brownish pollinose, its pile black; scutellum black, subshining, lightly brownish pollinose, bearing four bristles. Abdomen subdepressed, black, shining, its pile and long lateral bristles black; hypopygium rather large, ascending, abundant black pilose; central filament thick, free except near the apex,

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not fractured nor flexuous. Legs black, rather robust, simple; front metatarsi slightly thicker and longer than the middle ones, hind metatarsi much thicker and one-fourth longer than the front ones. Knob of halteres yellow. Wings brownish gray, stigma and veins dark brown, fourth vein entire.

Female.—Same as the male, with these exceptions: Under sides of middle and hind femora ciliate with nearly erect scales; front metatarsi not noticeably thicker than the middle ones.

Types.—Nos. 3221 and 3222, U.S.N.M.; length, 9 to 10 mm. Two males and four females captured by the writer in March.

Locality.—California.

RHAMPHOMYIA ABDITA, new species.

Male.—Head black, opaque gray pollinose; eyes contiguous, upper facets much larger than the lower; antennæ blackish, third joint broadly lanceolate, style almost one-third as long as the third joint; proboscis slightly longer than height of head. Thorax subopaque black, gray pollinose, its sparse pile and bristles black; pleura black, gray pollinose, its pile whitish; scutellum opaque gray pollinose, bearing four bristles. Abdomen somewhat depressed, black, subshining, its pile whitish; hypopygium small, the filament hidden. Legs black, hind tibiæ strongly curved inward near the base, front tibiæ dilated on the inner sides of the apical two-thirds, the dilated portion thickly ciliate with short setæ and pile; front metatarsi as thick as, but only two-thirds as long as, the hind ones; middle metatarsi much slenderer than the others. Knob of halteres dark yellow. Wings hyaline, veins normal, stigma brown.

Female.—Same as the male, with these exceptions: Hind tibiæ straight, front ones not dilated, front metatarsi noticeably thicker than the hind ones; both sides of femora, and of front and hind tibiæ, also inner sides of middle tibiæ on the basal third, ciliate with nearly erect scales.

Types.—Nos. 3223 and 3224, U.S.N.M.; length, 6 mm. One male and three females collected by Prof. C. V. Piper.

Locality.—Washington.

RHAMPHOMYIA VIRGATA, new species.

Female.—Head black, opaque gray pollinose next the antennæ, elsewhere shining; antennæ very dark brown, third joint but slightly narrowing toward the apex, which is unusually broad; style one-sixth as long as the third joint; proboscis three times as long as height of head, palpi brown. Thorax black, grayish white pollinose except four shining vittæ, a humeral spot, and the narrow lateral margin; the two median vittæ begin at the prothorax and extend slightly behind the suture; the lateral ones begin near the hind edge and extend three-

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fourths the distance to the front end; sparse pile and bristles black; pleura black, lightly white pollinose, its pile whitish; scutellum black, lightly white pollinose, bearing four bristles. Abdomen black, very shining, depressed, tapering posteriorly, its sparse pile whitish; narrow hind margins of segments 2 to 4 laterally whitish. Legs black, shining except on the coxæ, simple, rather slender; metatarsi of nearly an equal thickness, the hind ones one-fourth longer than the others. Knob of halteres pale yellow. Wings grayish hyaline, veins and stigma brown, fourth vein entire.

Type.—No. 3225, U.S.N.M.; one female; length, 7 mm.

Locality.—Massachusetts.

RHAMPHOMYIA SUDIGERONIS, new species.

Male.—Black in all its parts excepting the light yellow halteres and central filament of the hypopygium. Eyes contiguous, upper facets much larger than the lower ones; third antennal joint broad, two and a half times as long as broad, style nearly as long as the third joint; proboscis nearly twice as long as height of head. Thorax subshining, lightly gray pollinose, marked with three black vittæ, the pile confined to these vittæ and to the broad lateral margins, quite abundant and rather long, black; pleura light gray pollinose, its pile black. Scutellum subshining, naked except the four marginal bristles. Abdomen subshining, the base subdepressed, toward the tip somewhat compressed, its pile quite abundant and rather long, black; hypopygium rather large, upper lamellæ slender, shorter than the median, the latter only slightly longer than broad; central filament free except its apex, arcuate, rather robust. Legs rather robust, simple, the middle and hind tibiæ bearing several quite long bristles; front metatarsi somewhat thicker and one-third longer than the middle ones; hind metatarsi noticeably thicker and one-fourth longer than the front ones; hind coxæ greatly swollen at the middle. Wings uniformly pale brown, stigma dark brown, veins normal.

Female.—Same as the male, except that the abdomen is depressed, and the under side of the hind femora is ciliate with nearly erect scales.

Types.—Nos. 3226 and 3227, U.S.N.M.; length, 7 to 10 mm. Eleven males and six females collected by the writer in March and April.

Locality.—California.

RHAMPHOMYIA AMPLICELLA, new species.

Female.—Head black, gray pollinose; antennæ black, the third joint broad, gradually tapering to the apex, style one-fourth as long as the third joint; proboscis slightly longer than height of head, palpi black. Thorax, pleura, and scutellum black, opaque, gray pollinose, thorax marked with two blackish vittæ, its short, sparse pile and the bristles black; pile of pleura whitish; scutellum bearing four bristles. Abdo-

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men tapering to the tip, black, opaque, on the first five segments densely silvery white pollinose, that on the remaining segments grayish brown, its pile sparse, whitish. Legs black, simple; front metatarsi much thicker than the middle ones, as thick and nearly as long as the hind ones. Knob of halteres whitish. Wings hyaline on the costo-basal half, the remaining portion grayish brown, stigma and veins dark brown; discal cell unusually long, almost reaching the wing margin, second and third posterior cells united; posterior cross vein sinuous, its middle portion nearly parallel with the fourth vein, near its lower end bent at nearly a right angle.

Type.—No. 3228, U.S.N.M.; length, 4 mm. A single female captured by the writer in February.

Locality.—Southern California.

RHAMPHOMYIA STYLATA, new species.

Female.—Head black, grayish brown pollinose; antennæ black, third joint sublanceolate; style unusually large, over one-half as long as the third joint; proboscis slightly longer than height of head, palpi black. Thorax and scutellum black, subshining, lightly brownish gray pollinose, thorax marked with three blackish vittæ, its pile rather long, black; pleura black, opaque brownish gray pollinose, its pile black; scutellum bearing four bristles. Abdomen compressed, tapering to the apex, black, dark gray pollinose, the narrow hind margin of each segment except the first, shining; entire eighth segment shining, sparse pile of abdomen black. Legs very robust, black, under sides of the middle and hind femora, and inner sides of the hind tibiæ ciliate with nearly erect scales; hind femora nearly twice as thick as their tibiæ; front metatarsi slightly thicker than the middle ones, hind metatarsi considerably thicker and longer than the front ones. Knob of halteres pale yellow. Wings brownish gray, stigma brown, veins dark brown, fourth vein entire.

Type.—No. 3229, U.S.N.M.; length, 5½ mm. A single female taken by the writer in March.

Locality.—Southern California.

RHAMPHOMYIA PILIGERONIS, new species.

Male.—Head black, gray pollinose, eyes contiguous, upper facets much larger than the lower; antennæ black, third joint rather narrow, style one-fifth as long as the third joint; proboscis as long as height of head, palpi black. Thorax black, opaque, bluish gray pollinose, marked with three dark brown vittæ, its sparse pile, like the bristles, pale yellowish; pleura black, bluish gray pollinose, its pile white; scutellum black, gray pollinose, bearing four light yellow bristles. Abdomen black, opaque, grayish black pollinose, its pile long and quite abundant, light yellow; hypopygium very long, slender, projecting obliquely

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forward over the back, more than three times as long as perpendicular diameter of last abdominal segment; filament very thick at extreme base, then suddenly becoming slender and bristle-like, nearly twice as long as the hind femora, ascending over the back and slightly sinuous, beyond its middle curving and descending to the hypopygium. Legs simple, rather stout, blackish brown, the middle and hind pair beset with long light yellow bristles, which are excessively long on the under side of the hind femora and on outer side of the hind tibiæ; front and hind metatarsi of nearly an equal size, the middle ones much more slender and shorter than the others. Knob of halteres light yellow. Wings hyaline, stigma obsolete, veins brown, fourth vein entire but very slender, as is also the anterior intercalary and posterior cross vein.

Type.—No. 3230, U.S.N.M.; length, 4 mm. A single male collected by Mr. Charles Robertson.

Locality.—Illinois.

RHAMPHOMYIA FLEXUOSA, new species.

Male.—Head black, lightly gray pollinose, eyes contiguous, upper facets much larger than the lower ones; antennæ dark brown, the third joint black, sublanceolate, style nearly one-half as long as the third joint; proboscis nearly one-half longer than height of head, palpi black; thorax, pleura, and scutellum black, lightly grayish brown pollinose, subshining, the sparse pile and bristles black; scutellum bearing four bristles; abdomen black, shining, compressed, its pile rather long, sparse, black; hypopygium rather large, ascending; filament free, slender, yellow, not fractured, very flexuous toward the tip; legs slender, simple, wholly brownish black; front and middle metatarsi of an equal size, the hind ones twice as thick as and one-half longer than these. Knob of halteres light yellow; wings, uniformly brownish gray, veins and stigma dark brown, fourth vein entire.

Female.—Same as the male, except that the abdomen is dull brownish and tapers to the tip.

Types.—Nos. 3231 and 3232, U.S.N.M.; length, 6 mm. A single male and female in the Museum collection.

Locality.—Colorado.

RHAMPHOMYIA PARVA, new species.

Female.—Head black, bluish gray pollinose; antennæ black, third joint lanceolate; style one-sixth as long as the third joint; proboscis scarcely longer than height of head, palpi black. Thorax, pleura, and scutellum black, opaque, bluish gray pollinose, the sparse pile and bristles black; scutellum bearing four bristles. Abdomen very dark brown, opaque, very lightly gray pollinose, tapering posteriorly. Legs rather slender, dark brown; under sides of hind femora ciliate with nearly erect scales; front and middle metatarsi of an equal size, some-

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what slenderer, but scarcely shorter, than the hind ones. Knob of halteres pale yellow. Wings dark gray, veins and stigma brownish, fourth vein entire.

Type.—No. 3233, U.S.N.M.; one female; length, 2½ mm.

Locality.—Massachusetts.

RHAMPHOMYIA GILVIPILOSA, new species.

Female.—Black, the halteres yellowish. Head dark gray pollinose, a row of black bristles along each side of the front. Third joint of antennæ broad, two and one-half times as long as wide, the style one-fifth as long as the third joint; proboscis one-third longer than height of head. Thorax opaque, dark gray pollinose, marked with four black vittæ, its short pile and bristles yellowish; pleura gray pollinose, its pile white; scutellum bearing only two bristles. Abdomen subopaque, its pile rather long and abundant, yellowish white. Legs destitute of scales and of long pile; front metatarsi slightly thicker than the middle ones, hind metatarsi considerably thicker and one-third longer than the front ones. Wings pale brown, the stigma and veins slightly darker, last section of the fifth vein twice as long as the penultimate section.

Type.—No. 3234, U.S.N.M.; length, 4 to 5 mm. Collected by Dr. W. A. Nason and Mr. Charles Robertson.

Locality.—Illinois.

NEOCOTA, new genus.

Same as *Rhamphomyia*, except that the face is thickly covered with long pile. Third vein simple, not furcate, discal cell complete, sending three veins to the wing margin; anal cell shorter than the second basal, the vein at its apex nearly parallel with the hind margin of the wing.

Type *Neocota weedii*, new species, described below.

NEOCOTA WEEDII, new species.

Male.—Head black, face and front somewhat shining, face thickly covered with long black pile; eyes very narrowly separated; the interval narrower than width of the lowest ocellus; antennæ black, first joint three times as long as the second, thickly long black pilose above and below; third joint twice as long as the first, broad, slightly tapering on its basal three-fourths, thence rapidly tapering to the apex; style one-third as long as the third joint; proboscis scarcely longer than height of head, palpi blackish brown. Thorax black, opaque (markings effaced in the single specimen examined); pile of thorax long, abundant, black, that at each end of pleura black; scutellum bearing about twelve black bristles besides several long black pile. Abdomen depressed, black, opaque, the sides covered with abundant long black pile; hypopygium rather large, ascending; upper lamellæ very small, the intermediate ones very large, not tapering toward the apex, blackish brown, long black pilose; central filament yellow, hidden except on

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its basal third. Coxæ black, femora and tibiæ dark brown, tarsi black; legs simple, abundant long black pilose, front metatarsi distinctly thicker but not longer than the middle ones, hind metatarsi much thicker and one-third longer than the front ones. Halteres brownish yellow. Wings uniformly dark brown, fourth vein entire.

Type.—No. 3235, U.S.N.M.; length, 8 mm. A single specimen received from Prof. H. E. Weed, after whom the species is named.

Locality.—Mississippi.

Genus MEGHYPERUS, Loew.

MEGHYPERUS OCCIDENS, new species.

Male.—Black in all its parts, including the antennæ, proboscis, palpi, halteres, and legs; eyes contiguous, third antennal joint conical, slightly longer than wide, the arista two-thirds as long as the third joint; proboscis horizontal, nearly as long as height of head. Thorax subshining, lightly gray pollinose, that on the pleura more dense; scutellum bearing six black bristles. Abdomen opaque velvet black, its pile whitish; venter gray pollinose, hypopygium small, porrect, slightly longer than the seventh segment. Legs rather robust, destitute of bristles; upper sides of hind femora with a fringe of white pile, hind femora somewhat broader than any of the others, their tibiæ greatly dilated, widening from the base to the middle, then of nearly an equal width to the apex, which is rounded, at its greatest width nearly twice as wide as the hind femora; hind metatarsi nearly twice as thick as any of the others. Wings hyaline, stigma and veins brown, anal cell nearly as long as the second basal.

Female.—Same as the male, except that the eyes are broadly separated, front shining, abdomen subshining, hind tibiæ slightly narrower.

Types.—Nos. 3236 and 3237, U.S.N.M.; length, 2 to 3 mm. Three males and two females taken by the writer in April and June.

Locality.—Southern California.

Genus LEPTOPEZA, Macquart.

ANALYTICAL KEY TO THE SPECIES OF LEPTOPEZA.

Black, the palpi, greater portion of the legs, and the halteres yellowish; length, 4 mm ..... *flavipes.*

Yellowish, the head and greater portion of the abdomen, blackish; length nearly 4 mm ..... *compta.*

LEPTOPEZA COMPTA, new species.

Female.—Head black, gray pollinose, eyes contiguous; antennæ yellow, third joint elongate oval, twice as long as broad, the arista black and nearly twice as long as the antennæ; proboscis and palpi yellow,

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proboscis less than one-third as long as height of head. Thorax, pleura, scutellum, and metanotum yellow, scutellum bearing two long yellow bristles, besides several very short ones. Abdomen blackish brown, the first segment, narrow lateral margins and front margin of each segment, yellow; venter yellow. Legs slender, light yellow, including the coxæ. Halteres light yellow. Wings grayish hyaline, stigma wanting, first vein extending considerably beyond apex of discal cell.

Type.—No. 3238, U.S.N.M.; length, nearly 4 mm. Two female specimens, one of which was captured June 15.

Locality.—New Hampshire and Massachusetts.

Genus SYNECHES, Walker.

ANALYTICAL KEY TO THE SPECIES OF SYNECHES.

1. Wings unspotted, or marked with only one black spot 2
   Wings marked with a black spot beyond apex of first vein and another at apex of second vein; marginal cell at tip of first vein twice as wide as the submarginal cell at the same point ..... *simplex.*
2. Legs partly or wholly yellowish 3
   Legs wholly black, thorax marked with a white pollinose humeral spot, and with a similar one in front of the scutellum; stigma brownish ..... *albonotatus.*
3. Wings marked with a brown stigmal spot 4
   Wings with a pale grayish stigmal spot, femora wholly yellow .. *hyalinus* (p. 437).
   Wings unspotted, knob of halteres and the entire body black, apex of second vein strongly curved, bases of femora black ..... *pusillus.*
4. Marginal cell at apex of first vein twice as wide as the submarginal cell at the same point; knob of halteres whitish 5
   Marginal cell at tip of first vein not wider than the submarginal cell at the same point; knob of halteres black ..... *debilis* (p. 436).
5. Thorax wholly yellowish ..... *rufus.*
   Thorax marked with three black vittæ, or wholly blackish ..... *thoracicus.*

SYNECHES DEBILIS, new species.

Male.—Antennæ black, proboscis and palpi yellow. Thorax yellow, marked with three vittæ and a lateral spot of yellowish brown. Abdomen and knob of halteres black. Legs yellow, the last tarsal joint, apices of hind femora, middle of hind tibiæ and of their first tarsal joints, black. Wings grayish hyaline, stigma pale smoky brown, marginal cell at tip of first vein not wider than the submarginal cell at the same point.

Type.—No. 3239, U.S.N.M.; length, 3½ mm. Four specimens collected by the writer in June.

Locality.—District of Columbia and Maryland.

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SYNECHES HYALINUS, new species.

Female.—Opaque black; base of abdomen yellowish; antennæ and knob of halteres yellowish brown; proboscis and legs yellow; coxæ, trochanters, and tips of tarsi, black; wings hyaline; stigma pale grayish; marginal cell beyond apex of first vein nearly twice as wide as the submarginal cell at the same point.

Type.—No. 3240, U.S.N.M.; length, 5 mm. A single specimen captured by the writer.

Locality.—Maryland.

Genus HYBOS, Meigen.

ANALYTICAL KEY TO THE SPECIES OF HYBOS.

Knob of halteres yellowish, eyes widely separated on the face, proboscis horny, rigid, longer than height of head, under side of first two joints of hind tarsi provided with short black spines:

Wings hyaline to discal cell, the remainder brown ..... *reversus.*

Wings, except the stigma, wholly hyaline..... *slossonæ* (p. 437).

HYBOS SLOSSONÆ, new species.

Male and female.—Head, including the antennæ, proboscis, and palpi, black; face broad, whitish pollinose; proboscis slender, rigid, slightly longer than height of head, only slightly longer than the palpi. Thorax black, shining, lightly pollinose, the pile rather long, yellowish white; pleura black, subshining, lightly pollinose, no long pile in front of halteres; scutellum black, subshining, bearing two long yellowish apical bristles and several shorter ones. Abdomen black, shining, its long pile yellowish white; in the female not tapering to a point behind, its apex rounded. Coxæ and femora black, apices of front and middle femora yellow; front and middle tibiæ yellow, the hind ones black; tarsi yellow, under side of the first two joints of hind tarsi beset with small black points, sides of hind metatarsi destitute of long black spines. Knob of halteres yellow. Wings hyaline, the stigma grayish brown.

Types.—Nos. 3241 and 3242, U.S.N.M.; length, 3 to 4 mm. Eight males and nine females, one of which was received from Mrs. A. T. Slosson, to whom the species is respectfully dedicated.

Locality.—New Hampshire.

EUHYBUS, new genus.

Same as *Hybos*, with these exceptions: Eyes in both sexes contiguous on the face, proboscis much shorter than height of head, under side of hind tarsi destitute of short black spines, halteres black. Contains the species: *Hybos subjectus*, Walker, *H. purpureus*, Walker, and *H. triplex*, Walker.

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Genus PLATYPALPUS, Macquart.

An examination of the type of *Oscinis crassifemoris*, Fitch, now the property of the National Museum, proves that it belongs to *Platypalpus*. *P. aleripus*, Walker, is too imperfectly described to admit of giving it a place in the following table.

ANALYTICAL KEY TO THE SPECIES OF PLATYPALPUS.

1. Thorax wholly black 5
   Thorax largely or wholly yellowish, femora and tibiæ wholly yellow, third antennal joint short ovate 2
2. Without a black vitta on the thorax 3
   With such a vitta; head, middle of scutellum and dorsum of abdomen black, apical spur of middle tibiæ minute, first and second basal cells subequal, front femora scarcely thicker than the hind ones .... *mesogrammus*.
3. Head black 4
   Head and body and all the members except the eyes and antennal arista yellow, first basal cell shorter than the second, front femora twice as thick as the hind ones ..... *tersus* (p. 439).
4. First basal cell shorter than the second, sixth vein obsolete at base, proboscis wholly black, front femora moderately thickened ..... *lætus*.
   First basal cell as long as the second, sixth vein not obsolete at base, proboscis yellow basally, front femora not thickened ..... *flavirostris*.
5. Femora wholly yellow 6
   Femora yellow, front and hind ones marked with a subapical black dot, front femora moderately thickened, third antennal joint short ovate, first and second basal cells subequal ..... *apicalis*.
   Femora largely or wholly black, third antennal joint short ovate, first basal cell shorter than the second, front femora slightly thickened 11
6. Middle femora greatly thickened 7
   Middle femora subequal to the others, legs slender, subequal in size .... *vicarius*.
7. Tarsi yellow, apex of each joint black 8
   Tarsi, except the first joint, wholly blackish, third antennal joint short lanceolate, front femora slightly thickened, first and second basal cells equal in length, sixth vein not obsolete at base ..... *lateralis*.
   Tarsi of front legs of male wholly whitish, thickly white pilose; middle tarsi wholly black, the first joint ovate and on the side ciliate with short black pile; anal cell complete ..... *discifer*.
8. Anal cell open behind 9
   Anal cell complete, middle femora greatly thickened 10
9. Middle femora greatly thickened, spurs at tips of middle tibiæ large, front femora very thick, third antennal joint lanceolate, first and second basal cells subequal in length ..... *æqualis*.
   Middle femora moderately thickened, spurs at tips of front tibiæ medium, first two antennal joints yellow ..... *crassifemoris, debilis*.
10. Wings brownish; antennæ, except the tip, yellow (female) ..... *discifer*.
    Wings grayish hyaline, antennæ wholly black, the third joint short ovate, front femora moderately thickened, first basal cell shorter than the second ..... *trivialis*.
11. Pleura, except a small spot, wholly opaque, whitish pollinose, middle femora greatly thickened; inhabits the Atlantic States ..... *pachycnemus*.
    Pleura wholly shining, destitute of pollen, middle femora not thickened; inhabits California ..... *incultus* (p. 439).

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PLATYPALPUS TERSUS, new species.

Male and female.—Yellow in all its parts, only the eyes and arista black. Third antennal joint short oval, scarcely longer than broad. Front femora twice as thick as the hind ones, middle femora one-half thicker than the front ones. Wings hyaline, third and fourth veins parallel, second basal cell longer than the first, sixth vein obsolete on its basal fourth, anal cell therefore open behind except near its apex.

Types.—Nos. 3243 and 3244, U.S.N.M.; length, 2 to 3 mm. Five males and eleven females in the Museum collection.

Locality.—Georgia and North Carolina.

PLATYPALPUS INCULTUS, new species.

Male.—Head black, shining; antennæ black, third joint short oval, scarcely longer than broad, arista four times as long as the antennæ; proboscis one-half as long as height of head, palpi black. Thorax shining black, its pile quite abundant, but short, depressed, yellowish; pleura shining black, not pollinose; scutellum black, bearing two long apical and two much shorter lateral bristles. Abdomen like the thorax. Front coxæ yellowish, less than one-half as long as their tibiæ, the others black; front and middle legs yellowish, upper and lower sides of the femora blackish brown; tarsi and hind legs, except bases of tibiæ, blackish brown; front femora slightly thicker than the others, middle femora scarcely as thick as the hind ones; legs destitute of long bristles or pile. Knob of halteres yellowish. Wings hyaline, veins brownish, third vein reaching the costa slightly before the extreme apex of wing, second basal cell longer than the first a distance equaling three times the length of the cross vein at apex of the former cell; cross vein at apex of anal cell, and basal half of sixth vein, obliterated.

Type.—No. 3245, U.S.N.M.; length, 2 mm. A single male collected in April.

Locality.—Southern California.

Genus TACHYDROMIA, Meigen.

ANALYTICAL KEY TO THE SPECIES OF TACHYDROMIA.

Thorax wholly black 1
Thorax yellowish; inhabits Jamaica, West Indies ..... *bacis.*

1. Wings destitute of brown cross bands 2
Wings whitish, marked with two broad, brown cross bands; anal cross vein wanting, legs more or less yellowish, scutellum bearing four bristles *schwarzii* (p. 440).

2. Wings gray, costal edge to third vein brown, anal cross vein wanting, front and middle femora striped with black, the hind ones largely black *pusilla.*
Wings gray, veins bordered with brown; legs, antennæ, and halteres yellow *vittipennis.*

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Wings brown, the base, except a border to the fifth vein, white; anal cross vein present; legs wholly black, halteres whitish, inner sides of middle tibiæ not emarginate before the tips ..... *claripes.*

Wings hyaline, base white, a black spot at last third of the costal margin, legs and antennæ wholly black ..... *maculipennis.*

Wings brownish, the base white, anal cross vein present, middle femora yellow, inner sides of middle tibiæ of male emarginate near the tips 3

Wings wholly gray or brownish 4

3. Front and hind femora marked with black ..... *rapax.*

Front and hind femora wholly yellowish ..... *rostrata.*

4. Femora and antennæ wholly black 5

Femora, or at least the front and middle ones, partly or wholly yellow, middle femora wholly yellow 6

5. Tibiæ and knob of halteres yellow ..... *portæcola.*

Tibiæ and halteres black ..... *winthemi.*

6. Front femora marked with black 7

Front femora wholly yellow, legs yellow, the hind ones black, halteres and antennæ whitish ..... *postica.*

7. Tibiæ yellow, the middle and hind ones partly black, halteres and antennæ yellow ..... *similis.*

Tibiæ wholly yellow, scutellum bispinose ..... *fenestrata.*

TACHYDROMIA SCHWARZII, new species.

Male and female.—Head black, opaque gray pollinose, the cheeks shining; antennæ yellowish, the third joint short conical, the apical arista bristle-like, four times as long as the antennæ; palpi nearly as long as the proboscis and appressed to it, their front part densely covered with appressed silvery-white pile in the male. Thorax, pleura, scutellum and abdomen shining black. Legs dark brown; bases of tibiæ and of tarsi, and sometimes of the femora, yellowish. Knob of halteres whitish. Wings whitish, crossed by two broad, brown cross bands, the first extending from base of second vein to slightly beyond the posterior cross vein, the second extending from slightly beyond apex of fifth vein to a short distance beyond the tip of the second vein, leaving the base of the wing, a cross band just beyond the middle, and the tip of the wing, whitish; anal cross vein wanting, the other two of an equal length, the distance between them subequal to that between the small cross vein and base of the third vein, the second basal cell being much longer than the first; distance between tips of third and fourth veins equal to one-third of that between the second and third veins; marginal cell about one-half as wide as the submarginal.

Types.—Nos. 3246 and 3247, U.S.N.M.; male and female; length, 2½ mm. The Utah specimen was collected June 20, by Mr. E. A. Schwarz, after whom I take pleasure in naming this handsome species.

Locality.—Northern California and Utah.

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DESCRIPTION OF A NEW SUBSPECIES OF THE GENUS PEUCEDRAMUS, COUES.

By ROBERT RIDGWAY,
Curator of the Department of Birds.

THE specimens upon which this new subspecies is based have long been in the National Museum collection, having been presented by Mr. Osbert Salvin, who collected them in December, 1863. They, as well as others from the highlands of Guatemala, have always passed as Giraud's species;[1] but having compared them with Giraud's type, as well as with a considerable number of specimens of the same species from Arizona and Mexico, I find them to be quite different in the respects pointed out below, and therefore entitled to subspecific separation.

PEUCEDRAMUS OLIVACEUS AURANTIACUS, new subspecies.

Subspecific characters.—Similar to *P. olivaceus* (Giraud), but much smaller, and with head, neck, and chest very much brighter orange-tawny; female with throat and chest bright yellow (intermediate between wax and chrome yellow), instead of very pale yellow; much obscured by grayish or brownish white.

Male.—Wing, 2.85 inches; tail, 2 inches (in *P. olivaceus:* wing, 3 to 3.08 inches; tail, 2.15 to 2.21 inches).

Female.—Wing, 2.62 inches; tail, 1.82 inches (in *P. olivaceus:* wing, 2.88 to 2.90 inches; tail, 2.02 to 2.08 inches).

Range.—Highlands of Guatemala.

Type.—No. 30629, U.S.N.M.; male adult; Chilasco, Vera Paz, Guatemala, January, 1862; Osbert Salvin.

[1] *Sylvia olivacea*, Giraud, "Sixteen Species of Texas Birds," p. 29, pl. VII, fig. 2, 1841.

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PRELIMINARY DIAGNOSES OF NEW MAMMALS FROM THE MEXICAN BORDER OF THE UNITED STATES.[1]

By EDGAR A. MEARNS, M. D.

IN THE collection of mammals made in connection with the recent resurvey of the boundary line between Mexico and the United States, are several which appear to be new to science. In view of the probable delay in issuing the complete report on these collections, it seems desirable that the new forms should be briefly described in advance.

SPERMOPHILUS MEXICANUS PARVIDENS, new subspecies.

RIO GRANDE SPERMOPHILE.

Erxleben's "*Sciurus mexicanus*" was based on Fernandez's description of his Tlamototli, and on Seba's "*Sciurus rarissimus, ex Nova Hispana, tæniis albis.*" No locality was assigned in the inadequate description of Erxleben, but Lichtenstein, about 1830, accurately described and figured the species, from a specimen collected by Herr F. Deppe, in July, 1826, in the neighborhood of Toluca, Mexico. We can therefore fix the type locality of *Spermophilus mexicanus* as Toluca, Mexico.

Comparing six specimens of this species, from Kinney County, Texas, with an adult male—practically a topo-type of *S. mexicanus*—from Tlalpan, Mexico, lent me by Dr. C. Hart Merriam, who kindly furnished its measurements, taken in the flesh by the collector,[2] the Texas specimens prove to be smaller, less yellowish and paler, with distinctive cranial and dental characters.

Type.—No. 63073, U.S.N.M. (Coll. International Boundary Commission). Adult male, from Fort Clark, Kinney County, Texas. Collected by Dr. Mearns, March 21, 1893. Original number, 2312.

Description of type.—Smaller than *S. mexicanus;* pattern similar; colors paler, with under parts white, not washed with yellowish brown; tail bushier, its hairs with two instead of three black annuli, and gray-

[1] This is the second of a proposed series of papers giving preliminary descriptions of the new mammals collected on the recent survey of the Mexican boundary.

[2] Collected by E. W. Nelson, December 2, 1892. Length, 335 mm.; tail vertebræ, 148; hind foot, 50.

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[Advance sheets of this paper were published March 25, 1896.]

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ish instead of yellowish tips; ground-color of dorsum yellowish broccoli brown, instead of tawny olive. Length, measured from nose to end of caudal vertebræ, 325 mm.; tail vertebræ, 130; hind foot, 44. The dentition is relatively lighter than in *mexicanus* (typica), the ratio of the length of the upper tooth-row to the basi-cranial axis being, in the two forms, as 5 to 6. The skull of *mexicanus* is relatively high and narrow, with less spreading postorbital processes. The cranial measurements of the two specimens compared are as follows: Total length, 48–43 mm. (according to Hensel, 38–34.8); zygomatic breadth, 27–25; length of upper tooth-row, 10.5–8; height of skull, 15–13; across postorbitals, 18–17.5; between orbits, 10.2–8.2; basi-cranial axis (combined lengths of the basi-occipital and basi-sphenoid bones), 14.5–13.3.

SPERMOPHILUS HARRISI SAXICOLUS, new subspecies.

ROCK SPERMOPHILE.

Type.—No. 59869, U.S.N.M. (Coll. International Boundary Commission). Adult female, from Tinajas Altas, Gila Mountains, Yuma County, Arizona. Collected by Dr. E. A. Mearns and F. X. Holzner, February 17, 1894. Original number, 2983. Contained six large fœtuses.

Description of type.—Similar to *S. harrisi*, but much paler, with a longer tail. Length, 245 mm.; tail vertebræ, 93; ear from crown, 5; hind foot, 40.

This is a long-tailed, pallid, desert race, inhabiting bare granite ranges of mountains, extending in a southeasterly direction from the Gila River, in southwestern Arizona (Yuma County), into western Sonora.

Spermophilus harrisi was described by Audubon and Bachman from a specimen from an unknown locality. It now becomes expedient to restrict the application of the name *harrisi* to the darker form, which was found on the Mexican boundary line, from the Santa Cruz Valley westward as far as the Sonoyta, where intergrades were taken at Quitovaquito. The tail, in seven specimens of *S. harrisi* from Tucson, Arizona, measured in the flesh by Mr. P. L. Jouy, averaged 76 mm. in length.

LEPUS MERRIAMI, new species.

RIO GRANDE JACKRABBIT.

Lepus texianus, AUDUBON and BACHMAN, N. Am. Quad., III, p. 156, pl. cxxxiii, 1853 (Texas).

Lepus callotis, BAIRD, Mamm. N. Am., p. 590, 1857 (in part only); U. S. and Mex. Bound. Surv., pp. 45 and 46, 1859 (in part only).—ALLEN, N. Am. Rodentia, p. 350, 1877 ("Var. *callotis*," in part).

Type.—No. 2317 (Coll. International Boundary Commission). Adult female, from Fort Clark, Kinney County, Texas. Collected by Dr. Mearns, April 6, 1893. Similar to *L. callotis*, of Mexico, but with shorter ears, which are black instead of white at the tip; and the upper

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surface of the body inclines to grayish fawn-color rather than ochraceous buff.

This is the common "Jackrabbit" of the Rio Grande. It has been described by Audubon and Bachman, Baird, Allen, and other writers, under the preoccupied names of *callotis* and *texianus*, with which species it has been confounded.

PEROMYSCUS CANUS, new species.

TEXAS GRAY MOUSE.

Type.—No. $\frac{21199}{37098}$, U.S.N.M. (Coll. International Boundary Commission). Adult female, from Fort Clark, Kinney County, Texas. Collected by Dr. Mearns, January 13, 1893. Original number, 2208.

Description of type.—Above, drab gray, with a dark vertebral area, where the pelage is more thickly lined with black. Feet and under parts pure white; tail bicolored, blackish above, white below; ears and tail well clothed with hair; soles of feet densely pilose posteriorly; skull narrow, slender, and rectangular, with the brain-case low and elongated and the rostral portion long. Length, 175 mm.; tail vertebræ, 75; ear from crown, 11.5 (small); hind foot, 21. Teats, $\frac{1-2}{1-2}$.

Remarks.—This mouse is quite similar in size and coloration to *Peromyscus mearnsii*, Allen, from which it may be readily distinguished by its smaller, more hairy, ears, and its much shorter, more hairy, and sharply bicolored tail, as well as by its longer fur at all seasons. The skull of *P. mearnsii* is smaller, and has a more swollen brain-case, shorter and more depressed rostrum, and shorter pterygoid fossa. Perhaps the dentition is also a little heavier. Compared with *P. leucopus*, the skull is lower and more slender, with a corresponding shortening of the brain-case, pterygoid fossa, and rostrum. *Peromyscus texanus*, a very distinct species, occurs with *P. canus* in portions of its range.

PEROMYSCUS TORNILLO, new species.

TORNILLO MOUSE.

Type.—No. $\frac{20025}{31420}$, U.S.N.M. (Coll. International Boundary Commission). Adult male, from the Rio Grande, about 6 miles above El Paso, Texas. Collected by Edgar A. Mearns and Frank X. Holzner, February 18, 1892. Original number, 1458.

Description of type.—Upper parts light broccoli brown; ears and upper side of tail hair brown; feet and under parts pure white; body stout; ears and tail well haired, the latter sharply bicolored; soles densely pilose posteriorly. Length, 192 mm.; tail vertebræ, 90; ear above crown, 12; hind foot, 23.

The skull of this mouse is at once distinguished from all other Texan mice of this genus by its larger size. The animal bears superficial resemblance to the *P. arizonæ*, recently described by Dr. J. A. Allen,

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from Fairbank, on the San Pedro River, Arizona. Externally it is distinguished from that species by its paler coloration, slightly smaller ears, and stouter body. The largest skulls of *P. arizonæ* equal the average size of *P. tornillo*, but the shape differs considerably therefrom. In both, the rostral portion is long and high, this character sufficing to distinguish these species from *sonoriensis* and the other subspecies of *Peromyscus texanus*. The skull of *P. tornillo* is low and squarish, its zygomatic arches standing strongly out in front, as sharp elbows at right angles to the cranial axis.

PEROMYSCUS TEXANUS MEDIUS, new subspecies.[1]

SAN DIEGO PLAINS-MOUSE.

Between the ranges of the subspecies *gambelii* and *thurberi*, both dark-colored races of *Peromyscus texanus*, there is a narrow strip of southern and Lower California, bordering the Pacific Ocean for several hundred miles and extending east to the Coast Range of mountains, occupied by the present race, which differs from either of those above mentioned in being paler, with more drab and clay-colored tints. It is smaller than *P. t. gambelii*, with much larger ears, and a shorter tail. Its paler, more ochraceous coloration at once distinguishes it from *P. t. thurberi*, with which it agrees in size. From *P. t. deserticola*, of the interior deserts, it differs in being less robust, and in having somewhat larger ears, and much darker colors.

Type.—No. 61059, U.S.N.M. (Coll. International Boundary Commission). Adult male from Nachoguero Valley, Lower California. Collected by Dr. Mearns, June 4, 1894. Original number, 3623.

Description of type.—Above wood brown, shading to russet on cheeks and sides, thickly mixed with black, giving a dusky dorsal area; ears clove brown, densely clothed, with faint hoary edging; top of head wood brown, paler than back; feet and under parts pure white; tail black above, white on sides and below. Length, 160 mm.; tail vertebræ, 70; ear from crown, 17; hind foot, 21.

PEROMYSCUS TEXANUS CLEMENTIS, new subspecies.

SAN CLEMENTE MOUSE.

Forms of *Peromyscus texanus* have been collected on the Coronados Islands, and on Santa Rosa, Santa Catalina, and San Clemente, of the Santa Barbara group. Of these I have only examined those from

[1]For the species of mouse to which this subspecies and the next belong, the earliest name available is *Hesperomys texanus*, Woodhouse. Two of Dr. Woodhouse's specimens are still in the U. S. National Museum. One of these, the type, is alcoholic, and the other a skin. From these I have removed the skulls for examination. Baird's *Hesperomys texanus* is composite, four species of *Peromyscus* and an *Onychomys* having been included in his "list of specimens," as proven by specimens still extant. I have seen no evidence of intergradation between *P. leucopus* and the forms of *P. texanus*.

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Santa Rosa (2 specimens) and San Clemente Island (38 specimens, collected by myself and Mr. A. W. Anthony). The skins from Santa Rosa Island are referred to the mainland form (*P. t. medius*), though approaching *P. t. clementis*. This island race is much blacker than *P. t. medius*, with a stronger, more reddish coloration, except on the head, which is drab.

Type.—No. 61117, U.S.N.M. (Coll. International Boundary Commission). Adult male, from San Clemente Island, California. Collected by Dr. Mearns, August 27, 1894. Original number, 3819.

Description of type.—Above drab anteriorly, strongly tinged with burnt umber posteriorly; top of head, drab gray; ears black, with faint hoary edging; feet and under surface, white; tail sharply bicolored. Length, 177 mm.; tail vertebræ, 77; ear, 17; hind foot, 21.

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CHARACTERS OF A NEW AMERICAN FAMILY OF PASSERINE BIRDS.

By ROBERT RIDGWAY,

Curator of the Department of Birds.

IN "The Auk",[1] Mr. F. A. Lucas, curator of the department of comparative anatomy in the National Museum, has called attention to the notable characters presented in the skull of the genus *Procnias*, Illiger, at the same time remarking that my proposed establishment of a new family for its reception "is certainly warranted by the cranial characters of the genus." Although I had already drawn up a diagnosis of the external characters of the family, circumstances have until now prevented its publication. The diagnosis is herewith presented, the osteological and pterylographical characters being given in a separate paper by Mr. Lucas.[2]

Family PROCNIATIDÆ.

SWALLOW-TANAGERS.

Procniatinæ [*Tanagridæ*] SCLATER, Cat. Am. Birds, p. 54, 1862. (Subfamily.)

External characters.—Bill triangular, depressed, extremely broad at base but compressed at tip, the lateral outline changing from convex basally to concave terminally; gape very long, extending to beneath anterior angle of eye; gonys less than half as long as commissure and much less than breadth of bill at base; culmen sharply ridged, strongly recurved terminally; tip of maxilla slightly notched; nostrils exposed, very small, circular, surrounded by a slightly raised rim. Tarsi short (about as long as commissure, shorter than middle toe with claw), scutellate anteriorly, caligate posteriorly, the hinder margin contracted into a sharp edge; lateral claws not reaching base of middle claw; hind claw much stouter than middle claw. Wings long (more than five times as

[1] April, 1895, p. 186.

[2] Mr. Lucas' paper (Proc. U. S. Nat. Mus., XVIII, 1895, p. 451) follows immediately after the present one.

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long as tarsus); tip of longest primary exceeding that of ninth by a little more than length of tarsus and half of middle toe; second and third quills longest, first and fourth but little shorter. Tail more than half as long as wing, nearly even or very slightly emarginated. Plumage blended, glossy; remiges and rectrices very firm, almost rigid. Color mainly blue (greenish in female), the sides and flanks barred with black. Nest in holes; eggs pure white.

Range.—Neotropical region (Brazilian and Amazonian provinces, and northeastern portion of Colombian province).

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CATALOGUE OF A COLLECTION OF BIRDS MADE BY DOCTOR W. L. ABBOTT IN KASHMIR, BALTISTAN AND LADAK, WITH NOTES ON SOME OF THE SPECIES, AND A DESCRIPTION OF A NEW SPECIES OF CYANECULA.

By CHARLES W. RICHMOND,
Assistant Curator of the Department of Birds.

FOR several years past, the United States National Museum has been the recipient of valuable collections in various branches of natural history and ethnology, gathered by the patriotic American naturalist and explorer, Doctor W. L. Abbott, of Philadelphia, during his travels in various parts of the Old World. Mount Kilimanjaro and the lowlands of Taveta, East Africa, were the scenes of his first investigations, where for two years he was actively at work, and whence he sent to the Museum over a thousand bird skins and a large quantity of other material. He subsequently visited the Seychelles Archipelago in the early part of 1890, and other islands to the westward of that group during the latter half of 1892, pausing a short time in Madagascar on his way, and sending collections from time to time to the National Museum, as had been his custom. The collection of birds formed in the Seychelles and other islands in that vicinity has been studied by Mr. Ridgway, who has described some new species contained therein.[1] A more exhaustive account of the birds of this group by the same author is now in course of preparation and will doubtless soon be completed. The birds' eggs have been reported on by Major Bendire. Various obstacles have heretofore prevented a study of the birds of the African collections, but it is now thought probable that a thorough examination of these may be effected in the near future. Mr. True has already given a detailed account of the mammals.

Upon concluding his explorations in the Seychelles, Dr. Abbott visited Kashmir and Ladak, in northern India, and spent parts of the years 1891–1894 in travel and in the accumulation of material illustrating the natural history and ethnology of that region. In July, 1893, a journey

[1] Proc. U. S. Nat. Mus., XVI, No. 953, pp. 597–600, Aug. 16, 1893; XVII, No. 1008, pp. 371–373, Nov. 15, 1894.

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occupying over a year was undertaken from Ladak into Eastern Turkestan, and north to the Thian-Shan Mountains. Returning in the spring of 1894, he passed several months in the Tagdumbash Pamir.

Dr. Abbott has now returned to Madagascar, making his headquarters in a little-known part of that vast island, and his labors in this fascinating field will undoubtedly bring to light many interesting things.

The collections sent from the region embraced in the present paper—Kashmir, Baltistan and Ladak—number 746 well-prepared specimens, referable to 188 species, of which one, a *Cyanecula*, is apparently new. A number of the species are rare and of unusual interest, and the specimens, with a few unimportant exceptions, are accompanied with accurate data and notes on the colors of fading parts, measurements, etc. In view of this, it has been deemed worth while to present a complete catalogue of the collection, including the collector's notes on the labels of the specimens.

The localities visited by Dr. Abbott are in many instances those already well known through the work of Drs. Stoliczka, Scully, Major Biddulph, and others famous in Indian ornithology. A brief itinerary, as collated from the data accompanying his collection of birds, is here inserted.

The Vale of Kashmir was visited in the latter part of June, 1891, and the succeeding four months were passed there and in the immediate vicinity, with short excursions to the Lolab Valley, Nowboog Valley, the Pir Panjal range, Mount Montir, Srinagar, and Woolar Lake. In the early part of November the Sind Valley and Sonamarg were visited, and shortly after, Dras and the Dras Valley, where, after a short sojourn, Dr. Abbott proceeded to the Indus Valley in Baltistan, which was followed to Skardu, and the Shigar and Braldu valleys, at which latter place the whole month of December was spent. In January, 1892, Shigar Valley and Skardu, and Rondu in the Indus Valley, were revisited, and considerable time in February and March was passed at Haramosh. Rondu, Skardu, Gol, Khartaksho and Tarkuti, in the Indus Valley, were also visited in March, and Dras Valley and Sonamarg were revisited. Most of April was spent in the Vale of Kashmir, particularly at its western end, and collections were made in the Kaj Nag Mountains, Srinagar, Sopor, Woolar Lake, and Gunderbal. A large part of May and a few days of June were passed in the Vale of Kashmir and in the Nowboog Valley. The remainder of 1892 was passed among the islands northwest of Madagascar. In 1893 most of April, May and June were spent in or near the Vale of Kashmir, the Krishnagunga Valley and Mountains being visited; the latter half of June was spent at Sonamarg, Zogi-bul Pass, Dras, Kargil, Pashgam, Kharbu and Namika-la Pass, in Kashmir; and Khardong, Fotu-la Pass, Lamayuru, and Indus Valley, in Ladak. The first week of July was passed in Leh, when a short trip to Suget, Eastern Turkestan, was made, followed shortly by a return to Khardong. A few days were

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spent in the Nubra Valley, journeying toward Sasser Pass, where a short pause was made. Another expedition to Eastern Turkestan here followed, lasting over a year, and the region under consideration was not again visited until September, 1894, when Dr. Abbott stopped a short while at Khardong on his way to the coast.

Many of the species contained in the Kashmir collections had been provisionally named by Mr. F. L. J. Boettcher,[1] upon receipt of the successive installments, and little has remained for me to do in such cases but to verify those identifications. Mr. W. E. Brooks has, at my request, been kind enough to examine a series of willow warblers and two or three other species, and verify or correct my identifications of the same, for which my thanks are due him.[2]

In the matter of classification, I have used, for the sake of convenience and to facilitate comparison, the sequence of families and species employed by Dr. Sharpe,[3] but, as will be observed, I have endeavored to adhere closely to the American Ornithologists Union's regulations regarding nomenclature, and have adopted several of Dr. Stejneger's "inconvenient discoveries."

Family VULTURIDÆ.

1. GYPS HIMALAYENSIS, Hume.

Male, immature, Braldu Valley, Baltistan, December 25, 1891. "Bill greenish; irides light brown; length, 47 inches; extent, 108 inches; weight, 22 lbs."

Family FALCONIDÆ.

2. ACCIPITER NISUS (Linnæus).

Female, adult, western Kashmir, July 3, 1891; 7,000 feet.

Male, immature, Lolab Valley, Kashmir, July 12, 1891.

Male, adult, Vale of Kashmir, August 13, 1891.

Male, immature, Shigar Valley, Baltistan, January 4, 1892; 8,000 feet. "Bill leaden, black at tip; cere greenish yellow; feet orange, claws black; irides lemon yellow; length, 12½ inches."

Female, adult, Woota Valley, Kashmir, April 25, 1892.

Male, adult, Naj Marg, Kashmir, May 16, 1893.

3. BUTEO PLUMIPES, Hodgson.

Male, adult, central Kashmir, September 22, 1891; 11,000 feet. "Bill black, becoming light leaden at base; cere yellowish green; feet greenish yellow, claws black; irides dirty white; length, 20¾ inches."

Male, adult, central Kashmir, September 24, 1891; 11,000 feet. "Bill black, becoming horn blue at base; edge of gape orange; feet yellow, claws black; irides light brown; weight, 1½ lbs."

[1] Mr. Boettcher was temporarily employed in the Department of Birds at the time.

[2] His notes, followed by the initials "W. E. B.", will be found under those species.

[3] Scientific Results of the Second Yarkand Mission: Aves.

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The two specimens are not in the same plumage, the last being much darker above and below, with nearly uniform chocolate-brown thighs, and ferruginous breast.

4. BUTEO FEROX (Gmelin).

Female, adult, central Kashmir, July 31, 1891; 13,000 feet. "Bill dark horn; feet and cere yellow; irides pale yellowish white; length, 23½; extent, 57 inches; weight, 2½ lbs."

Female, adult, Sind Valley, Kashmir, November 6, 1891; 6,000 feet. "Cere green; feet orange yellow; irides brownish gray; length, 23¼ inches; weight, 2½ lbs."

The latter specimen is in the dark "*aquilinus*" plumage, but the under parts are nearly uniform, without whitish markings on the breast or neck.

5. GYPAËTUS BARBATUS (Linnæus).

Female, adult, central Kashmir, October 2, 1891; 11,000 feet. "Upper mandible pale horn color, becoming black at tip; lower mandible leaden; irides straw color; toes dull leaden above; claws dark horn; length, 45 inches; extent, 109 inches; weight, 13½ lbs."

Female, adult, Braldu Valley, Baltistan, December 28, 1891. "Feet dull leaden; claws black; irides brownish gray; bill leaden; sclerotics orange red; length, 46 inches; extent, 106 inches; weight, 12 lbs."

6. HALIÆETUS LEUCORYPHUS (Pallas).

Female, immature, Vale of Kashmir, Woolar Lake, September 6, 1891. "Feet dirty white; claws black; bill black; irides light brown; lower mandible bluish white at base; cere dark leaden blue; length, 31 inches; extent, 78½ inches; weight, 5 lbs. Abundant about this lake."

7. MILVUS MELANOTIS, Temminck and Schlegel.

Female, immature, Vale of Kashmir, August 9, 1891. "Length, 23½ inches."

Female, immature, Vale of Kashmir, August 22, 1891; 6,000 feet. "Bill black; base of lower mandible bluish white; cere greenish yellow; feet greenish white; claws black; irides dark brown; length, 25¼ inches."

Female, adult, central Kashmir, September 29, 1891; 11,000 feet. "Bill black, lower mandible greenish yellow at base; gape greenish yellow; feet pale greenish yellow, claws black; cere greenish yellow; irides light brown; length, 24¾ inches."

Female, immature, Vale of Kashmir, October 27, 1891; 5,000 feet. "Length, 23¾ inches."

8. FALCO SUBBUTEO, Linnæus.

Female, immature, central Kashmir, September 22, 1891; 11,000 feet. "Bill bluish white at base, becoming black at tip; feet and orbital skin yellow; claws black; length, 12¾ inches."

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Female, immature, central Kashmir, September, 1891; 10,000 feet. "Upper mandible dark horn blue; base of lower mandible bluish white; feet yellow; cere green; irides dark brown."

Male, adult, Krishnagunga Valley, Kashmir, April 23, 1893; 6,500 feet. "Bill horn blue, black at tip; cere yellow; orbital skin yellow; irides dark brown; feet yellow, claws black; length, 13¼ inches."

Female, adult, Krishnagunga Valley, Kashmir, April 23, 1893; 6,500 feet. "Bill horn blue, tip black; cere and orbital skin yellow; feet yellow, claws black; length, 14 inches; irides dark brown."

Male, adult, Lolab Valley, Kashmir, May 12, 1893; 6,000 feet. "Bill horn blue, black at tip, yellowish at base; feet yellow, claws black; cere and orbital skin greenish yellow; irides brown; length, 12¾ inches."

9. FALCO TINNUNCULUS, Linnæus.

Female, adult, central Kashmir, July 31, 1891; 13,000 feet. "Bill nearly white, becoming dark horn blue at tip; cere greenish yellow; legs orange."

Female, adult, central Kashmir, September 17, 1891; 11,000 feet. "Bill bluish white at base, becoming black at tip; feet orange yellow; length, 13 inches."

Female, adult, central Kashmir, September 22, 1891; 11,000 feet. "Bill light leaden blue at base, becoming black at tip; cere yellowish green; feet orange yellow; length, 14¼ inches. Extremely fat."

Female, adult, central Kashmir, September 22, 1891; 11,000 feet. "Length, 14 inches."

Female, adult, central Kashmir, September 26, 1891; 11,000 feet. "Length, 13⅞ inches."

Female, adult, Vale of Kashmir, April 12, 1892; 5,200 feet. "Bill horn blue, blackening at tip; lower mandible yellowish at base; feet orange yellow, claws black; cere orange; irides dark brown; length, 13½ inches."

Male, adult, Kaj Nag Mountains, Kashmir, April 23, 1892; 8,000 feet. "Bill horn blue, black at tip; cere orange yellow; feet orange yellow; claws black; irides dark brown; length, 13½ inches."

Female, adult, Leh, Ladak, July 2, 1893; 11,500 feet. "Bill horn yellow, black at tip; cere yellow; irides dark brown; feet dirty orange, claws black; length, 13¾ inches."

Family BUBONIDÆ.

10. BUBO BUBO TURCOMANUS (Eversmann).

Adult, Vale of Kashmir, winter, 1891–'92.

Female, adult, Khardong, Ladak, September 1, 1894; 12,000 feet. "Length, 27 inches."

This form has been recorded from northern India on several occasions, and I have little hesitancy in referring the above-mentioned specimens to it. They show the characters advanced for *B. b. turcomanus* very

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clearly, and on this account I do not consider them to represent the pale form of the Eagle Owl described by Hume as *B. hemachalana*, which he avers is "of precisely the same type of coloration" as the Eagle Owl of Europe, but "very much paler." In *B. b. turcomanus* the pattern of coloration of the tail and wings particularly departs considerably from that of the typical Eagle Owl, but I do not consider the present bird to be specifically distinct from it, as advanced by some.

11. ASIO ACCIPITRINUS (Pallas).

Male, adult, Shigar Valley, Baltistan, January 11, 1892; 8,000 feet. "Bill black, except extreme tip, which is white; claws black; irides golden yellow; length, 13⅛ inches."

12. SYRNIUM ALUCO BIDDULPHI (Scully).

Female, adult, central Kashmir, September 30, 1891; 11,000 feet. "Length, 18¼ inches." Wing, 12.60 inches; tail, 8.20.

Female, adult, central Kashmir, October 10, 1891; 9,000 feet. "Length, 17⅜ inches." Wing, 12.37 inches; tail, 8.60.

Female, adult, Nowboog Valley, eastern Kashmir, May 31, 1892; 7,000 feet. "Bill pale greenish; claws fleshy, black at tip; soles yellowish; irides brown." Wing, 12.82 inches; tail, 9.12.

If *S. a. biddulphi* is distinct from *Syrnium aluco nivicolum*, our specimens should be referred as above, but I am at present unable to satisfactorily determine its status, having at hand no specimens of *S. a. nivicolum* for comparison.

13. CARINE NOCTUA BACTRIANA (Hutton).

Male, immature, Shyok River, below Sasser Pass, Ladak, July 22, 1893; 14,000 feet. "Bill yellowish green; cere wax brown; length, 9¼ inches."

Female, immature, Shyok River, below Sasser Pass, Ladak, July 22, 1893; 14,000 feet. "Bill yellowish green; cere wax brown; irides yellow; claws horn black; soles of feet yellow; length, 9¼ inches."

Family CORVIDÆ.

14. CORVUS FRUGILEGUS, Linnæus.

Adult, Vale of Kashmir, winter of 1891–'92.

15. CORVUS CORAX, Linnæus.

Male, adult, Shigar Valley, Baltistan, November 22, 1891; 8,000 feet. "Length, 26½ inches." Wing, 17.80 inches; tail, 10.40; tarsus, 2.75; culmen, 2.80.

Female, adult, Shigar Valley, Baltistan, November 22, 1891; 8,000 feet. "Length, 24 inches." Wing, 16.15 inches; tail, 10.25; tarsus, 2.60; culmen, 2.57.

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Male, immature, Lamayuru, Ladak, June 27, 1893; 11,500 feet. "Bill and feet black; irides blackish brown; length, 27 inches. Common and very tame about the village, acting as scavengers." Wing, 17.80 inches; tail, 11.00; tarsus, 2.75; culmen, 2.87.

16. CORVUS MONEDULA COLLARIS (Drummond).

Male, adult, Kangam, Sind Valley, Kashmir, April 1, 1892; 6,000 feet. "Bill and feet black; irides white; length, 14⅞ inches."

Adult, Kangam, Sind Valley, Kashmir, April 1, 1892; 6,000 feet. "Bill and feet black; irides white; length, 14⅞ inches."

Female, immature, Vale of Kashmir, August 8, 1891.

Male, immature, Vale of Kashmir, August 9, 1891.

Male, immature, Vale of Kashmir, August 9, 1891. "Irides brownish gray."

17. CORVUS SHARPII, Oates.

Male, adult, Skardu, Baltistan, November 20, 1891; 7,000 feet. "Bill black; feet shining black; length, 18¾ inches."

18. CORVUS SPLENDENS, Vieillot.

Male, adult, Srinagar, Kashmir, April 3, 1892. "Bill and feet black; irides dark brown; length, 17 inches."

Female, adult, Srinagar, Kashmir, April 4, 1892.

19. CORVUS CORONE, Linnæus.

Male, adult, Braldu Valley, Baltistan, December 23, 1891; 10,000 feet. "Length, 21¾ inches."

Male, adult, Shigar Valley, Baltistan, January 4, 1892; 8,000 feet. "Bill and feet black; irides dark brown; length, 19½ inches."

20. CORVUS MACRORHYNCHUS LEVAILLANTII (Lesson).

Female, adult, western Kashmir, July 2, 1891; 7,000 feet.

Male, adult, western Kashmir, July 8, 1891; 8,000 feet.

Male, adult, central Kashmir, August 2, 1891; 12,000 feet. "Length, 21½ inches."

Male, immature, north slope of Pir Panjal range, Kashmir, August 22, 1891; 7,000 feet. "Length, 20½ inches."

Male, adult, Indus Valley, Kashmir. November 15, 1891; 9,000 feet. "Length, 21 inches."

Male, adult, Shigar Valley, Baltistan, November 23, 1891.

Female, adult, Shigar Valley, Baltistan, November 23, 1891; 8,000 feet.

Male, adult, Shigar Valley, Baltistan, January 14, 1892; 8,000 feet. "Bill and feet black; irides dark brown; length, 21¾ inches."

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Male, adult, Shigar Valley, Baltistan, January 14, 1892; 8,000 feet. "Bill and feet black; irides dark brown; length, 19 inches."

Male, adult, Haramosh, Baltistan, February 26, 1892; 7,000 feet. "Bill and feet black; irides dark brown; length, 21 inches."

This series represents only one form, apparently the one designated above. The birds are positively not *C. corone*, of which two specimens were sent, nor can they, owing to their large size, be *C. culminatus*.

Measurements of Corvus macrorhynchus levaillantii (Lesson).

U. S. N. M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
125680	Female ad.	Western Kashmir.....	July 2	13.12	8.50	2.10	2.20
125681	Male ad...	.....do.....	July 8	13.60	9.30	2.27	2.32
125679	Male ad...	Central Kashmir.....	Aug. 2	13.90	9.75	2.19	2.35
125678	Male im...	Pir Panjal range, Kashmir.	Aug. 22	12.62	8.10	2.30	2.30
126864	Male ad...	Indus Valley, Kashmir ...	Nov. 15	13.00	9.00	2.25	2.15
126860	Male ad...	Shigar Valley, Baltistan ..	Nov. 23	13.50	9.10	2.17	2.30
126861	Female ad.	.....do.....	...do	13.00	9.20	2.10	2.11
126865	Male ad...	.....do.....	Jan. 14	13.85	9.10	2.31	2.39
126863	Female ad.	.....do.....	...do	12.75	8.55	2.08	2.08
126862	Male ad...	Haramosh, Baltistan.....	Feb. 26	13.30	9.00	2.18	2.31
		Average.....	.....	13.26	8.96	2.20	2.25

21. PICA PICA (Linnæus).

Male, adult, Dras, Kashmir, November 10, 1891; 10,000 feet. "Length, 20⅜ inches. Not observed in Kashmir proper, but noticed as soon as we crossed to Ladak side of Zogi-bul Pass."

Adult, Indus Valley, Baltistan, November 18, 1891; 8,000 feet. "Bill and feet black; irides dark brown; length, 18⅜ inches. Common about all the villages, and very tame."

Female, adult, Braldu Valley, Baltistan, December 26, 1891; 9,000 feet. "Length, 19 inches."

The Dras specimen is not at all typical, being, in fact, much nearer *P. p. leuconotos* than to the present form. The white on the primaries extends from within a half to a quarter of an inch of the tips of the feathers. The Indus Valley specimen is somewhat aberrant in having the three central pairs of rectrices conspicuously tipped with white!

22. UROCISSA FLAVIROSTRIS CUCULLATA (Gould).

Male, adult, Lolab Valley, Kashmir, July 10, 1891. "Bill yellow; feet orange."

Male, adult, Vale of Kashmir (western part), April 13, 1892. "Bill yellow; feet orange red; length, 22¼ inches."

Judging from descriptions alone, and having in mind Dr. Sharpe's comments on the bird, I believe this to be a good subspecies of *U. flavirostris*. The latter is said to be "very dark and gray in shade below"[1] in its typical state, while the form *U. f. cucullata* is described as

[1] Sharpe, Cat. Birds Brit. Mus., III, p. 73.

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very pale, almost white, below. The case seems to be similar to one on our Mexican border, where the Green Jay, *Xanthoura luxuosa*, passes gradually into another form, *X. l. cyanocapilla*, in Guatemala and Honduras. The under parts vary from green in the first case, to bright yellow in the last.

23. NUCIFRAGA MULTIPUNCTATA, Gould.

Male, adult, western Kashmir, July 5, 1891; 9,000 feet.

Male, adult, western Kashmir, July 5, 1891; 9,000 feet.

Female, adult, western Kashmir, July 7, 1891; 8,000 feet.

Female, adult, Nowboog Valley, eastern Kashmir, August 16, 1891; 7,000 feet. "Length, 14½ inches."

Male, adult, Nowboog Valley, eastern Kashmir, August 16, 1891; 7,000 feet.

Male, adult, Nowboog Valley, eastern Kashmir, August 16, 1891; 7,000 feet. "Bill and feet black; irides dark brown; length, 14½ inches."

Male, adult, Pir Panjal range, Kashmir, August 30, 1891; 8,000 feet. "Length, 14½ inches."

Female, adult, Sind Valley, Kashmir, November 8, 1891; 9,000 feet. "Feeding on seeds from pine cones, when shot."

24. GRACULUS GRACULUS (Linnæus).

Female, adult, Pir Panjal range, Kashmir, August 27, 1891; 12,000 feet. "Bill and feet coral red; irides dark brown."

Female, adult, Sonamarg, Sind Valley, Kashmir, November 7, 1891; 8,500 feet. "Bill and feet deep red. Numerous in this marg, feeding on the wheat stubble in company with *Corvus macrorhynchus*."

Female, adult, Braldu Valley, Baltistan, November 24, 1891; 8,500 feet. "Bill and feet coral red; length, 16¼ inches."

Male, adult, Braldu Valley, Baltistan, December 23, 1891; 10,000 feet. "Bill and feet dark red; length, 17⅛ inches."

25. PYRRHOCORAX PYRRHOCORAX (Linnæus).

Female, adult, Indus Valley, Kashmir, November 14, 1891; 9,000 feet. "Bill yellow; irides dark brown; feet bright red. Very common in these barren mountains, in some localities."

Female, adult, Braldu Valley, Baltistan, January 3, 1892; 9,000 feet. "Bill yellow; feet bright red; irides dark brown; length, 15½ inches."

Male, adult, Shigar, Baltistan, January 24, 1892; 8,000 feet. "Bill yellow; feet red; irides dark brown; length, 15⅜ inches."

Family ORIOLIDÆ.

26. ORIOLUS KUNDOO, Sykes.

Male, adult, Vale of Kashmir, June 25, 1891.

Female, immature, Vale of Kashmir, June 25, 1891.

Immature, Vale of Kashmir, May, 1892.

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Male, adult, Vale of Kashmir, May, 1892.

Male, adult, Lolab Valley, Kashmir, May 13, 1893; 6,000 feet. "Length, 9¾ inches."

Family DICRURIDÆ.

27. DICRURUS ATER (Hermann).

Male, adult, Vale of Kashmir, June 25, 1891.

Female, adult, Vale of Kashmir, June 25, 1891.

Male, immature, Lolab Valley, Kashmir, July 10, 1891.

Female, adult, Vale of Kashmir, June 1, 1893. "Bill and feet black; irides red; length, 11 inches."

Family STURNIDÆ.

28. STURNUS HUMII, Brooks.

Male, adult, Vale of Kashmir, June 25, 1891.

Female, adult, Vale of Kashmir, June 28, 1891.

Female, immature, Vale of Kashmir, August 8, 1891.

Male, immature, three specimens, same locality and date as last.

Male, adult, Gunderbal, Vale of Kashmir, April 2, 1892. "Bill yellow, lower mandible gray at base; feet reddish brown; irides brown; length, 8½ inches."

Male, adult, Lolab Valley, Kashmir, May 11, 1893; 6,000 feet. "Bill yellow, base dirty white; feet reddish brown; irides reddish brown; length, 8⅛ inches."

29. ACRIDOTHERES TRISTIS (Linnæus).

Female, adult, Vale of Kashmir, June 22, 1891.

Female, immature, Vale of Kashmir, August 13, 1891.

Male, adult, eastern Kashmir, August 14, 1891; 6,000 feet. "Bill and feet yellow; lower mandible greenish; bare skin around eyes orange."

Family FRINGILLIDÆ.

30. PYCNORHAMPHUS ICTEROIDES (Vigors).

Male, adult, Pir Panjal range, Kashmir, August 30, 1891; 8,000 feet. "Bill green; feet pale flesh color; irides dark brown; length, 9¼ inches."

Male, immature, Pir Panjal range, Kashmir, August 30, 1891; 8,000 feet. "Bill green; feet brownish flesh color; irides dark brown; length, 8¾ inches."

Male, immature, central Kashmir, September 17, 1891; 10,000 feet.

Female, adult, western Kashmir, July 7, 1891; 8,000 feet. "Bill light green; feet pale."

Female, immature, western Kashmir, September 11, 1891; 9,000 feet.

The immature female differs from the adult chiefly in having a

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brownish wash to the gray of the upper parts, middle pair of tail feathers, throat and breast, and in having the rump pale brownish buff like the abdomen.

31. PYCNORHAMPHUS CARNEIPES (Hodgson).

Female, adult, Braldu Valley, Baltistan, November 30, 1891; 11,000 feet. "Bill dark horn brown, blackening at tip; lower mandible pale at base; irides hair brown; length, 9⅛ inches. Shot in one of the few and small jungles to be found in this desolate region."

32. CARDUELIS CARDUELIS CANICEPS (Vigors)

Male, adult, four specimens, Vale of Kashmir, June, 1891, and May, 1892.

Female, immature, Vale of Kashmir, August 12, 1891.

33. CALLACANTHIS BURTONI (Gould).

Male, adult, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet. "Bill yellow; feet light brown; length, 7 inches."

Female, adult, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet. "Bill yellow; feet brownish flesh."

Male, adult, central Kashmir, September 13, 1891; 10,000 feet. "Bill orange yellow; feet brownish flesh. Common in the pine woods at this elevation, going about in flocks of ten or a dozen. Feed mostly upon the ground. Note resembles that of our American Goldfinch."

Male, immature, central Kashmir, September 13, 1891; 10,000 feet.

Female, adult, central Kashmir, September 13, 1891; 10,000 feet. "Bill horn yellow; feet dirty flesh color."

The immature male in the collection differs from the adult of that sex in having no trace of crimson in the plumage, and otherwise as follows: Top of head sepia, the feathers with concealed blackish bases, passing into wood brown on the nape and forehead; back brown (between raw umber and sepia), with a tinge of burnt umber on the scapulars; rump and upper tail-coverts raw umber; entire under parts dark cinnamon, lighter on abdomen, and with a tinge of russet on the throat; a russet band over the eye; lower part of cheeks, malar stripe and a line on each side of the throat dull blackish. Wing as in the adult, but white terminal spots on outer webs of tertials with a buffy edging; lesser wing-coverts brown; middle coverts with terminal buff spots to the feathers; tail as in the adult, with buffy edgings to the three central pairs of feathers instead of white tips.

34. ACANTHIS CANNABINA FRINGILLIROSTRIS (Bonaparte and Schlegel).

Male, adult, Shigar, Baltistan, January 24, 1892; 8,000 feet. "Upper mandible pale horn brown; lower mandible pale leaden, becoming yellowish at gonys; irides brown; feet dark brownish flesh color; length, 6 inches."

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35. MONTIFRINGILLA ADAMSI, Moore.

Male, adult, Fotu-la Pass, Ladak, June 27, 1893; 12,000 feet. "Bill and feet black; length, 7⅛ inches."

Male, adult, Fotu-la Pass, Ladak, June 27, 1893; 12,000 feet. "Bill and feet black; irides pale brown; length, 6¾ inches."

Male, immature, Namika-la Pass, Kashmir, June 26, 1893; 11,000 feet. "Bill brownish yellow; feet dark fleshy brown; culmen dark brown; length, 6½ inches."

36. MONTIFRINGILLA SORDIDA (Stoliczka).

Male, adult, central Kashmir, July 26, 1891; 11,000 feet.

Female, adult, central Kashmir, July 28, 1891; 12,000 feet. "Bill dark horn brown; feet dark brown; irides light brown."

Female, adult, central Kashmir, July 29, 1891; 12,000 feet. "Upper mandible and feet dull dark brown; base of lower mandible light brown; irides light brown."

Female, adult, central Kashmir, July 29, 1891; 12,000 feet.

Female, adult, central Kashmir, July 29, 1891; 13,000 feet.

Male, immature, Sind Valley, Kashmir, November 8, 1891; 9,000 feet. "In great flocks in the Zogi-bul Pass (11,300 feet), leading into Ladak."

Female, immature, Braldu Valley, Baltistan, December 29, 1891; 9,000 feet. "Upper mandible dark horn brown; lower mandible pale; irides clear brown; feet dark fleshy brown; length, 6⅛ inches."

Male, adult, Haramosh, Baltistan, February 16, 1892; 5,500 feet. "Bill horn brown, pale at base; feet dark brown; irides orange brown; length, 6½ inches."

37. LEUCOSTICTE BRANDTI, Bonaparte.

Male, adult, Khardong, Ladak, June 14, 1893; 13,000 feet. "Bill and feet black; irides brown; length, 7½ inches."

Male, adult, Sasser Pass, Ladak, July 22, 1893; 16,000 feet. "Bill and feet black; irides brown; length, 7⅛ inches."

Female, adult, Sasser Pass, Ladak, July 22, 1893; 16,000 feet. "Bill and feet black; length, 6⅞ inches."

38. BUCANETES MONGOLICUS (Swinhoe.)

Male, adult, Shigar Valley, Baltistan, November 22, 1891; 7,500 feet.

Female, adult, Shigar Valley, Baltistan, November 22, 1891; 8,000 feet. "Length, 5½ inches."

39. PASSER DOMESTICUS INDICUS (Jardine and Selby).

Male, adult, Vale of Kashmir, August 9, 1891. Two specimens.

Female, adult, Vale of Kashmir, August 9, 1891.

Female, adult, Vale of Kashmir, August 12, 1891.

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Male, adult, Vale of Kashmir, November 4, 1891; 5,000 feet.

Female, adult, Shigar Valley, Baltistan, January 13, 1892; 8,000 feet. "Feet brownish flesh; length, 6 inches; bill horn brown, yellowish at base."

Male, adult, Shigar, Baltistan, January 19, 1892; 8,000 feet. "Bill pale horn brown, becoming yellowish at gape; irides hair brown; length, 6¼ inches."

Male, adult, Shigar, Baltistan, January 19, 1892; 8,000 feet. "Length, 6⅛ inches."

Male, adult, Shigar, Baltistan, January 19, 1892; 8,000 feet. "Length, 6¼ inches."

Female, adult, Shigar, Baltistan, January 19, 1892; 8,000 feet. "Length, 6 inches."

40 PASSER CINNAMOMEUS (Gould).

Male, adult, western Kashmir, July 7, 1891; 8,000 feet.

Male, adult, western Kashmir, July 6, 1891; 8,000 feet.

Male, adult, Baltal, Sind Valley, Kashmir, March 30, 1892; 9,000 feet. "Bill black; feet fleshy brown; irides brown; length, 5⅜ inches."

Male, adult, Baltal, Kashmir, March 30, 1892; 9,000 feet. "Bill black; feet brownish black; irides brown; length, 5⅝ inches."

Male, adult, Baltal, Kashmir, March 30, 1892; 9,000 feet. "Length, 5½ inches."

Male, adult, Bandipoor Nullah, Kashmir, July 14, 1891; 6,000 feet.

41. METOPONIA PUSILLA (Pallas.)

Female, adult, Dras Valley, Kashmir, November 12, 1891; 9,000 feet.

Male, immature, Braldu Valley, Baltistan, November 24, 1891; 8,000 feet. "Bill and feet black; lower mandible slightly paler at base."

Male, adult, Braldu Valley, Baltistan, December 2, 1891; 11,000 feet. "Bill black, except base of lower mandible, which is pale brown; feet black."

Male, adult, Braldu Valley, Baltistan, December 2, 1891; 11,000 feet. "Bill black, except base of lower mandible, where pale; feet black; length, 5¼ inches."

Male, immature, Braldu Valley, Baltistan, December 2, 1891; 11,000 feet. "Bill dark horn, except base of lower mandible, which is pale; length, 4⅞ inches."

Female, adult, Rondu, Baltistan, March 14, 1892; 6,500 feet. "Bill blackish horn; irides dark brown; feet black; length, 5 inches."

Male, adult, Rondu, Baltistan, March 14, 1892; 6,500 feet. "Bill and feet black; length, 5⅛ inches."

Male, adult, Rondu, Baltistan, March 14, 1892; 6,500 feet. "Bill horn black; feet black; irides dark brown; length, 5 inches."

Female, immature, Rondu, Baltistan, March 14, 1892; 6,500 feet. "Bill and feet black; length, 5 inches."

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42. CARPODACUS ERYTHRINUS (Pallas).

Male, Krishnagunga Valley, Kashmir, May 7, 1893; 6,000 feet. "Bill dark horn brown; feet dark fleshy brown."

Male, adult, Dras, Kashmir, June 23, 1893; 10,000 feet. "Bill yel lowish brown; feet dark brown."

Male, adult, Namika-la Pass, Kashmir, June 26, 1893; 11,000 feet. "Upper mandible dark horn brown; lower mandible paler brown; feet dark fleshy brown."

Male, adult, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Bill pale horn brown; feet fleshy brown."

Male, adult, junction of Shyok and Nubra rivers, Ladak, July 16, 1893; 10,000 feet. "Bill dark horn brown, yellowish beneath; feet fleshy brown."

Male, immature, Nubra Valley, Ladak, July 17, 1893; 10,000 feet. "Bill dark horn brown, lower mandible paler; feet dark fleshy brown."

Female, adult, Shyok River, Ladak, July 15, 1893; 11,000 feet. "Bill horn brown; irides brown; feet reddish brown."

43. CARPODACUS SEVERTZOVI, Sharpe.

Male, adult, Nubra Valley, Ladak, July 18, 1893; 11,000 feet. "Upper mandible pale horn brown, lower mandible fleshy; irides brown; feet brownish black."

44. CARPODACUS THURA, Bonaparte and Schlegel.

Male, immature, central Kashmir, July 23, 1891; 11,000 feet.

I am not positive that this is typical *C. thura*; it agrees in a general way with descriptions of the female of that species, but differs enough to raise a doubt in my mind as to its proper place. Having no specimens of *C. thura* with which to compare it, and finding no description of the immature male, I am obliged to leave the matter unsettled. The specimen measures: Wing, 3.23 inches; tail, 2.82; tarsus, 0.89; culmen, 0.50.

45. PYRRHOSPIZA LONGIROSTRIS, Prjevalsky.[1]

Male, adult, Khardong Pass, Ladak, July 14, 1893; 16,000 feet. "Upper mandible dark horn brown, lower mandible pale brownish flesh; feet brownish black; irides brown; length, 7½ inches." Wing, 4.48 inches; tail, 3.28; tarsus, 0.99; culmen, 0.65.

46. PYRRHULA AURANTIACA, Gould.

Male, adult, central Kashmir, July 22, 1891; 11,000 feet.

Male, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. "Bill black; feet brown; length, 5⅜ inches."

[1] See a subsequent paper on Dr. Abbott's Turkestan collection in the present volume.

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Male, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. "Bill black; feet brownish black; length, 5⅝ inches."

Female, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. "Bill black; feet fleshy brown; irides dark brown; length, 5⅝ inches."

Female, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. "Bill black; feet brownish; length, 5¾ inches."

47. EMBERIZA FUCATA, Pallas.

Male, adult, Nowboog Valley, Kashmir, August 15, 1891; 7,000 feet.

Female, adult, Vale of Kashmir, north slope of Pir Panjal range, August 21, 1891; 7,000 feet.

Female, young; same locality, date and altitude.

Male, young, same locality, date, and altitude.

Male, adult, Vale of Kashmir (western end), May 11, 1893; 7,000 feet. "Upper mandible dark horn brown; lower mandible pale horn brown; feet pale fleshy brown; irides dark brown; length, 6 inches."

48. EMBERIZA CIA, Linnæus.

Male, immature, Braldu Valley, Baltistan, December 29, 1891; 9,000 feet. "Upper mandible dark horn brown, lower mandible leaden; legs pale fleshy; gape yellowish; irides dark brown; length, 7 inches."

Female, immature, Braldu Valley, Baltistan, December 29, 1891; 9,000 feet. "Feet pale flesh; length, 6½ inches."

Female, immature, Shigar Valley, Baltistan, January 13, 1892; 8,000 feet. "Feet brownish flesh; length, 6⅛ inches."

Female, immature, Skardu, Baltistan, January 27, 1892; 7,000 feet. "Feet flesh color, toes brownish; irides dark brown; length, 6¾ inches."

Male, adult, Haramosh, Baltistan, February 16, 1892; 5,000 feet. "Upper mandible blackish horn, lower mandible leaden; feet pale fleshy brown; irides dark brown; length, 6⅜ inches."

From the dates of the specimens collected by Dr. Abbott this species would appear to be a winter visitant only in this region, as will doubtless prove to be the case. All of the summer specimens in the collection are referable to the form *E. c. stracheyi*.

49. EMBERIZA CIA STRACHEYI (Moore).

Male, adult, the Lolab, Kashmir, July 1, 1891.

Female, adult, the Lolab, Kashmir, July 9, 1891.

Male, adult, western Kashmir, July 2, 1891; 7,000 feet.

Male, young, Bandipoor Nullah, Kashmir, July 14, 1891; 6,000 feet.

Female, adult, Mount Montir, Kashmir, July 16, 1891; 10,000 feet.

Male, adult, Vale of Kashmir, August 14, 1891.

Male, young, Vale of Kashmir, August 14, 1891.

Male, adult, Nowboog Valley, eastern Kashmir, August 15, 1891; 7,000 feet. "Upper mandible, and tip of lower, black; base of lower mandible pale blue; feet brownish flesh color."

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Young, eastern Kashmir, August 15, 1891; 7,000 feet.

Male, adult, eastern Kashmir, August 18, 1891; 6,000 feet.

Male, young, north side of Pir Panjal range, Kashmir, August 22, 1891; 7,000 feet.

Male, young, central Kashmir, September 20, 1891; 9,000 feet.

Male, adult, Sind Valley, Kashmir, November 6, 1891; 6,000 feet. "Length, 6⅞ inches."

50. EMBERIZA STEWARTI, Blyth.

Male, adult, Indus Valley, Kashmir, November 15, 1891; 9,000 feet.

Male, adult, Vale of Kashmir, May 28, 1893. "Upper mandible dark horn brown; lower mandible leaden; feet brownish flesh."

Male, adult, Vale of Kashmir, May 28, 1893. "Upper mandible dark horn brown; lower mandible leaden; feet brownish flesh; irides dark brown; length, 6 inches."

51. EMBERIZA LEUCOCEPHALA (Gmelin).

Female, adult, Sind Valley, Kashmir, November 6, 1891; 6,000 feet. "Upper mandible brownish black; lower mandible leaden blue; feet brownish flesh color; length, 7¼ inches."

Female, immature, Sind Valley, Kashmir, November 6, 1891; 7,000 feet.

Female, adult, Sind Valley, Kashmir, November 7, 1891; 7,000 feet.

Family ALAUDIDÆ.

52. OTOCORIS LONGIROSTRIS, Moore.

Male, adult, central Kashmir, September 23, 1891; 11,000 feet. "Bill nearly black above; base of lower mandible bluish white; feet black, soles whitish; irides brown; length, 8½ inches."

Male, adult, Namika-la Pass, Kashmir, June 26, 1893; 12,000 feet. "Bill horn black, base of lower mandible fleshy white; feet black, soles whitish; length, 8½ inches."

Male, young, Khardong Pass, Ladak, July 13, 1893; 15,000 feet. "Bill dirty yellow, tip brown; feet pale brownish flesh color; irides brown; length, 7⅛ inches."

53. OTOCORIS PENICILLATA (Gould).

Male, adult, Skardu, Baltistan, January 28, 1892; 7,000 feet. "Bill horn black, base of lower mandible yellow; feet black; length, 7⅝ inches."

54. ALAUDA ARVENSIS CANTARELLA (Bonaparte).

Male, adult, Skardu, Baltistan, November 21, 1891; 7,000 feet. "Upper mandible black along culmen, rest of bill whitish; irides brown; tarsi reddish brown; toes brownish, claws dark brown; length, 7½ inches."

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Male, adult, Haramosh, Baltistan, February 16, 1892; 5,000 feet. "Bill yellowish, black along culmen; irides pale brown; feet brownish flesh· length, 7¼ inches."

55. ALAUDA ARVENSIS INTERMEDIA (Swinhoe).

Male, adult, Vale of Kashmir, June 27, 1891.

Male, adult, Vale of Kashmir, August 12, 1891.

Male, adult, Vale of Kashmir, October 27, 1891; 5,000 feet.

Adult, Vale of Kashmir, winter of 1891–'92.

Male, adult, Mount Montir, central Kashmir, July 16, 1891; 10,000 feet. Two specimens.

Male, adult, central Kashmir, September 23, 1891; 11,000 feet. "Upper mandible dark brown above, pale along commissure; lower mandible paler; feet pale brownish flesh color; length, 6⅝ inches."

Male, adult, Leh, Ladak, July 3, 1893; 11,500 feet. "Bill dark brown above, pale fleshy beneath; feet pale fleshy brown; length, 6¾ inches."

Two of the above specimens (those taken September 23 and October 27), in fresh winter plumage, differ from the rest in possessing shorter and slenderer bills, but whether this is due to age, or represents a more northern form, I am unable to decide.

This is the *Alauda guttata* or *A. leiopus* of authors. The name *leiopus* of Hodgson, being a *nomen nudum*, can not be used, and the same applies to the *Alauda dulcivox* of the same author. *Alauda intermedia* of Swinhoe[1] is apparently the first available name for this bird, antedating the *Alauda guttata* of Brooks by about thirteen years. The name was originally applied to birds from Shanghai, but as near as I can ascertain, birds from Vladivostok are referable to the same form, and as we have specimens from the latter place, I have used them for comparison with the Kashmir birds, with which they appear to be identical.

In the event of the Kashmir birds proving distinct from those of the east of China, they should, of course, receive the name *guttata* of Brooks.

56. CALANDRELLA TIBETANA, Brooks.

Female, adult, Leh, Ladak, July 1, 1893; 11,000 feet. "Upper mandible dark horn brown; lower mandible dull yellow; irides brown; feet pale brown; length, 5⅝ inches."

Male, adult, Leh, Ladak, July 3, 1893; 11,500 feet. "Bill dark horn brown above, dirty yellow beneath; irides brown; feet pale fleshy brown, soles yellowish; length, 6 inches."

Male, adult, Leh, Ladak, July 3, 1893; 11,500 feet. "Bill dark horn brown above, dirty yellow beneath; feet pale fleshy brown, soles yellowish; length, 6 inches."

[1] Proc. Zool. Soc. London, 1863, p. 89.

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57. GALERIDA CRISTATA BOYSII (Blyth).

Female, adult, Haramosh, Baltistan, February 16, 1892; 5,500 feet. "Upper mandible horn brown; lower mandible dirty white; irides pale brown; feet flesh color; length, 6¾ inches." Wing, 3.75 inches; tail, 2.25; culmen, 0.63; tarsus, 0.95.

The name given above appears to be the correct one for the crested lark of northern India.

Family MOTACILLIDÆ.

58. MOTACILLA PERSONATA, Gould.

Adult, Vale of Kashmir, winter of 1891–'92.

Female, adult, Haramosh, Baltistan, March 9, 1892; 5,000 feet. "Bill and feet black; irides dark brown; length, 7⅞ inches."

Female, adult, Skardu, Baltistan, March 17, 1892; 7,500 feet. "Bill and feet black; length, 7¾ inches."

Male, adult, Skardu, Baltistan, March 18, 1892; 7,500 feet. "Bill and feet black; irides very dark brown; length, 8⅜ inches."

59. MOTACILLA HODGSONI, Blyth.

Male, adult, Bandipoor Nullah, Kashmir, July 14, 1891; 6,000 feet.

Male, young, Vale of Kashmir, August 25, 1891.

Female, adult, Vale of Kashmir, September 4, 1891.

Male, adult, Vale of Kashmir, October 28, 1891; 5,000 feet. "Bill and feet black; irides dark brown; length, 8¼ inches."

Male, adult, Shigar Valley, Baltistan, November 23, 1891; 7,500 feet.

Male, adult, Tarkuti, Indus Valley, Baltistan, March 24, 1892; 8,600 feet. "Bill and feet black; irides dark brown; length, 8 inches."

Female, adult, Tarkuti, Indus Valley, Baltistan, March 24, 1892; 8,600 feet. "Bill and feet black; irides dark brown; length, 7½ inches."

60. MOTACILLA MELANOPE, Pallas.

Female, adult, western Kashmir, July 5, 1891; 7,000 feet.

Female, adult, central Kashmir, July 29, 1891; 11,000 feet. "Length, 7 inches."

Young, Pir Panjal range, Kashmir, August 27, 1891.

Male, immature, Indus Valley, Baltistan, November 18, 1891; 8,000 feet. "Length, 7½ inches."

Male, adult, Tarkuti, Indus Valley, Baltistan, March 24, 1892; 8,600 feet. "Bill horn black; feet fleshy brown; irides dark brown; length, 7 inches."

Male, adult, Sonamarg, Kashmir, March 31, 1892; 8,600 feet. "Bill black; feet dark fleshy brown; length, 7½ inches."

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61. BUDYTES CITREOLOIDES, Gould.

Male, adult, Vale of Kashmir, June 22, 1891.

Female, immature, Vale of Kashmir, August 25, 1891.

Male, adult, Atchibal, Vale of Kashmir, May 26, 1892. "Bill and feet black; irides very dark brown; length, 7¼ inches."

Male, adult, Vale of Kashmir, May 21, 1893. "Bill and feet black; irides dark brown; length, 7 inches."

Male, adult, Vale of Kashmir, June 3, 1893. "Bill and feet black."

Female, adult, Nowboog Valley, eastern Kashmir, August 16, 1891; 7,000 feet. "Irides brown; length, 6½ inches."

Male, adult, Nowboog Valley, eastern Kashmir, May 30, 1892; 6,500 feet. "Bill and feet black; length, 7¼ inches."

Male, adult, Nowboog Valley, eastern Kashmir, May 30, 1892; 6,500 feet. "Bill and feet black; length, 7 inches."

Female, immature, Nubra Valley, Ladak, July 18, 1893; 11,000 feet. "Bill and feet black; irides dark brown; length, 6¾ inches."

The adult female sent by Dr. Abbott agrees in general with Dr. Sharpe's description,[1] but has the crown and nape suffused with olive yellow, as is said to be the case in *B. citreola*. The specimen is in worn breeding plumage and will not admit of a satisfactory description.

The two immature females appear to be somewhat similar to males of the same age, but lack the streak of black on each side of the crown, and the black malar stripe and spots on lower throat are absent; the middle and greater wing-coverts are narrowly edged and broadly tipped with white; the secondaries and tertiaries are edged with grayish white; lores, broad superciliary line, and entire under parts whitish, with a very faint yellow tinge in places; axillaries and under wing-coverts dusky white. In one of the specimens, collected July 18, a feather on the breast is white on one web and yellow on the opposite one. It would appear from this that the yellow of the adult plumage is, to some extent at least, assumed by a change of color in the feathers.

62. ANTHUS TRIVIALIS (Linnæus).

Male, adult, central Kashmir, July 25, 1891; 11,000 feet.

Female, adult, central Kashmir, July 26, 1891; 11,000 feet.

Male, adult, central Kashmir, July 26, 1891; 11,000 feet.

Female, adult, central Kashmir, July 26, 1891; 11,000 feet.

Female, adult, central Kashmir, September 13, 1891; 10,000 feet.

Male, adult, central Kashmir, September 15, 1891; 10,000 feet. "Length, 6½ inches. Common in small flocks in the alpine meadows."

Male, adult, Lolab, Kashmir, September 10, 1891; 8,000 feet. "Upper mandible dark brown; lower mandible pale flesh color; feet pale flesh color."

The four specimens obtained in July from central Kashmir are in breeding plumage, and are undoubtedly resident birds.

[1] Cat. Birds, Brit. Mus., X, p. 508.

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63. ANTHUS SIMILIS, Jerdon.

Female, young, Vale of Kashmir, August 12, 1891. "Feet pale flesh color; upper mandible and tip of lower, dark brown; base of lower mandible flesh color; length, 8 inches."

Male, young, Vale of Kashmir, September 7, 1891. "Feet brownish flesh color."

Female, young, Vale of Kashmir, September 7, 1891. "Feet brownish flesh color; irides brown; upper mandible black; lower mandible flesh color at base, brown at tip; length, 7⅞ inches."

Male, adult, Vale of Kashmir, May 17, 1893; 5,500 feet. "Upper mandible brownish black; lower mandible flesh color; feet yellowish brown; length, 8⅛ inches."

64. ANTHUS ROSEATUS, Blyth.

Female, adult, central Kashmir, July 17, 1891; 11,000 feet.

Female, adult, central Kashmir, July 17, 1891; 10,000 feet.

Female, adult, central Kashmir, July 23, 1891; 11,000 feet. Three specimens.

Female, adult, central Kashmir, July 27, 1891; 12,000 feet.

Hodgson's name, *Anthus rosaceus* (or *roseaceus*?), for this bird, occurring in MS. and unpublished drawings deposited in the British Museum, can not be properly used, and the same name,[1] given by Gray, is likewise to be rejected. I have been unable in this connection to consult the original reference to Blyth's name,[2] and am not positive that a description is there given, but in the absence of any information to the contrary, think it well to adopt his name. In case Blyth's name be found to lack a clear title, that of *Anthus roseaceus*, Horsfield and Moore, may be used.

Family CERTHIIDÆ.

65. CERTHIA HIMALAYANA, Vigors.

Female, adult, western Kashmir, July 7, 1891; 8,000 feet.

Female, immature, Pir Panjal range, Kashmir, August 30, 1891; 8,000 feet.

Male, immature, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

Male, adult, Skardu, Baltistan, November 20, 1891; 7,000 feet. "Upper mandible dark horn brown; lower mandible pale flesh, except at tip; feet brownish flesh color; length, 6 5/16 inches."

Female, adult, Shigar Valley, Baltistan, January 13, 1892; 8,000 feet. "Upper mandible almost black; lower mandible white at base, becoming brown at tip; feet brown; irides brown; length, 6⅛ inches."

Female, adult, Haramosh, Baltistan, February 16, 1892; 5,000 feet.

[1] Zoological Miscellany (1844); without description or plate.

[2] Journ. Asiat. Soc. Bengal, XVI, 1847, p. 437.

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"Upper mandible black; lower mandible pale flesh; feet dark fleshy brown; length, 5½ inches."

Female, adult, Kaj Nag Mountains, Kashmir, April 19, 1892; 9,000 feet. "Upper mandible very dark brown; lower mandible fleshy white; feet dark fleshy brown, soles pale; length, 5⅝ inches."

66. CERTHIA FAMILIARIS HODGSONI (Brooks).

Female, adult, central Kashmir, July 22, 1891; 11,000 feet.

Male, adult, Pir Panjal range, Kashmir, August 30, 1891; 8,000 feet. "Length, 5⅝ inches."

Male, adult, Pir Panjal range, Kashmir, August 30, 1891; 8,000 feet.

Female, adult, Pir Panjal range, Kashmir, August 30, 1891; 8,000 feet.

Three of the examples here recorded are without the buffy spot on the fourth primary. The fourth, a male, has a small spot, but very much smaller than the one on the fifth primary.

67. TICHODROMA MURARIA (Linnæus).

Adult, Vale of Kashmir, winter of 1891–'92.

Male, adult, Indus Valley, Baltistan, November 18, 1891; 8,000 feet. "Length, 6½ inches."

Male, adult, Skardu, Baltistan, January 25, 1892; 7,000 feet. "Bill and feet black; irides brown; length, 6½ inches."

Male, adult, Skardu, Baltistan, January 25, 1892; 7,000 feet. "Bill and feet black; irides brown; length, 6¼ inches."

Family SITTIDÆ.

68. SITTA CASHMIRENSIS, Brooks.

Female, adult, western Kashmir, July 3, 1891; 7,000 feet.

Male, adult, Vale of Kashmir, August 14, 1891.

Male, adult, Vale of Kashmir, August 15, 1891; 7,000 feet.

Male, adult, north slope of Pir Panjal range, Vale of Kashmir, August 21, 1891; 6,000 feet. "Length, 5⅝ inches."

Male, adult, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

Male, adult, Kaj Nag Mountains, Kashmir, April 23, 1892; 8,000 feet. "Bill black, lower mandible white at base; feet dark brown; irides dark brown; length, 5½ inches."

Male, adult, Kaj Nag Mountains, Kashmir, April 25, 1892; 8,000 feet. "Bill black, lower mandible white at base; feet brown; irides brown; length, 5½ inches."

69. SITTA LEUCOPSIS, Gould.

Male, adult, Mount Montir, Kashmir, July 16, 1891; 10,000 feet

Adult, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

Female, adult, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

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Male, adult, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.
Male, adult, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.
Male, adult, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet. "Bill and feet black: base of lower mandible white."

Family PARIDÆ.

70. PARUS NIPALENSIS, Hodgson.

Female, young, north side of Pir Panjal range, Kashmir, August 22, 1891; 7,000 feet.
Female, adult, Vale of Kashmir, June 28, 1891.
Male, adult, Vale of Kashmir, June 29, 1891.
Male, young, Vale of Kashmir, August 24, 1891.
Male, adult, Sind Valley, Kashmir, November 5, 1891; 6,000 feet.
Female, adult, Sind Valley, Kashmir, November 6, 1891; 6,000 feet.
Male, adult, Skardu, Baltistan, November 20, 1891; 7,000 feet. "Length, 6 inches."
Male, adult, Braldu Valley, Baltistan, December 29, 1891; 9,000 feet. "Bill black; legs leaden; irides dark brown; length, 6⅛ inches."

71. PARUS MONTICOLUS, Vigors.

Female, adult, western Kashmir, July 3, 1891; 7,000 feet.
Female, adult, Krishnagunga Valley, northwest Kashmir, May 5, 1893; 7,000 feet. "Bill black; feet leaden; irides dark brown; length, 4⅞ inches."
Female, adult, Krishnagunga Valley, northwest Kashmir, May 10, 1893; 7,000 feet. "Bill black; feet leaden; irides dark brown; length, 5⅛ inches. Was about to lay eggs."
Male, adult, Krishnagunga Valley, Kashmir, May 10, 1893; 7,000 feet. "Bill black; feet leaden; length, 5 inches."

72. PARUS MELANOLOPHUS, Vigors.

Female, young, western Kashmir, July 2, 1891; 7,000 feet.
Female, adult, western Kashmir, July 3, 1891; 7,000 feet.
Female, adult, western Kashmir, July 6, 1891; 8,000 feet.
Male, adult, Indus Valley, above Rondu, Baltistan, January 30, 1892; 7,000 feet. "Bill black; feet leaden blue; irides brown; length, 4¼ inches."
Female, adult, Indus Valley, above Rondu, Baltistan, January 30, 1892; 7,000 feet. "Bill black; feet leaden blue; irides brown; length, 4¼ inches."
Male, adult, Indus Valley, above Rondu, Baltistan, January 29, 1892; 7,000 feet. "Bill black; feet leaden blue; irides brown; length, 4⅜ inches."

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Male, adult, Haramosh, Baltistan, March 8, 1892; 9,000 feet. "Bill black; feet leaden blue; length, 4¼ inches."

Male, adult, Kaj Nag Mountains, Kashmir, April 14, 1892; 7,000 feet. "Bill and feet black; length, 4¼ inches."

73. PARUS RUFONUCHALIS, Blyth.

Female, adult, eastern Kashmir, August 15, 1891; 7,000 feet.

Female, adult, Pir Panjal range, Kashmir, August 31, 1891; 7,000 feet.

Female, adult, Baltal, Sind Valley, Kashmir, March 31, 1892; 9,000 feet. "Bill black, whitish at extreme tip; feet dark leaden blue; irides dark brown; length, 5 inches."

Male, adult, Kaj Nag Mountains, Kashmir, April 24, 1892: 10,000 feet. "Bill black; feet leaden blue; length, 5 inches."

Male, immature, Nowboog Valley, eastern Kashmir, May 29, 1892; 7,000 feet. "Bill black; feet leaden; irides dark brown; length, 5⅛ inches."

74. SYLVIPARUS MODESTUS, Burton.

Male, adult, north slope of Pir Panjal range, Kashmir, August 22, 1891; 7,000 feet.

75. ÆGITHALISCUS LEUCOGENYS (Moore).

Male, adult, Haramosh, Baltistan, February 16, 1892; 5,000 feet. "Bill black; feet orange brown; irides yellow; length, 4⅝ inches."

Male, adult, Haramosh, Baltistan, February 16, 1892; 5,000 feet. "Bill black; feet orange brown; irides yellow; length, 4½ inches."

Female, adult, Haramosh, Baltistan, February 16, 1892; 5,000 feet. "Bill black; feet orange brown; irides yellow; length, 4⅛ inches."

76. LEPTOPŒCILE SOPHIÆ, Severtzoff.

Male, adult, Braldu Valley, Baltistan, January 2, 1892; 9,000 feet. "Bill black; irides bright red; feet almost black; length, 4⅜ inches. Frequents low thickets; constantly on the move, uttering a low, soft cry."

Female, adult, Braldu Valley, Baltistan, January 2, 1892; 9,000 feet. "Bill and feet black; irides bright red; length, 4½ inches."

Female, adult, Haramosh, Baltistan, February 26, 1892; 7,000 feet. "Bill and feet black; irides bright red; length, 4½ inches."

Family LANIIDÆ.

77. LANIUS ERYTHRONOTUS (Vigors).

Female, adult, June 22, 1891.

Female, adult, June 25, 1891.

Female, immature, August 24, 1891. "Irides dark brown; length, 8⅜ inches."

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Female, immature, August 25, 1891.

Male, immature, August 25, 1891.

Immature, August 25, 1891.

Female, adult, April 11, 1892; 5,200 feet. "Bill and feet black; irides dark brown; length, 9 inches."

Female, adult, June 1, 1893. "Bill and feet black, solos pale; irides dark brown; length, 8¼ inches."

All from Vale of Kashmir.

Family SYLVIIDÆ.

78. ACROCEPHALUS STENTORIUS (Hemprich).

Male, adult, Vale of Kashmir, May 25, 1892. "Tarsi brown; toes plumbeous; upper mandible black; lower mandible fleshy; irides pale brown; length, 8 inches."

Adult, Vale of Kashmir, May, 1892.

Female, adult. Dal Lake, Vale of Kashmir, May 25, 1893. "Irides pale brown; length, 7½ inches."

Male, adult, Dal Lake, Vale of Kashmir, May 25, 1893. "Feet dull leaden, soles pale; irides pale brown; length, 7¾ inches."

Male, adult, Dal Lake, Vale of Kashmir, May 25, 1893. "Feet dull leaden, soles pale; upper mandible very dark horn brown; lower mandible flesh color; irides pale brown; length, 8 inches."

79. TRIBURA MAJOR (Brooks).

Male, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. "Bill brownish black above, brownish flesh beneath; feet pale brownish flesh; irides clear brown; length, 5¾ inches."

Male, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. "Bill blackish brown above, fleshy beneath; irides clear brown; length, 6 inches."

Female, adult, Nubra Valley, Ladak, July 18, 1893; 11,000 feet. "Bill black; feet pale flesh; irides pale brown; length, 6⅛ inches."

There is no apparent color difference between the sexes as represented in these specimens, except that in the female the under mandible is black. All of the specimens are conspicuously spotted on the chest, and in this feature differ strikingly from the colored figures accompanying Dr. Sharpe's "Aves" of the "Second Yarkand Mission."

80. SYLVIA CURRUCA ALTHÆA (Hume).

Male, adult, Lolab Valley, Kashmir, July 10, 1891.

Male, adult, Lolab Valley, Kashmir, April 20, 1893. "Bill black, base of lower mandible leaden; feet dark fleshy brown; irides clear brown; length, 5¼ inches."

Male, adult, Lolab Valley, Kashmir, May 12, 1893; 6,000 feet.

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Male, adult, Nowboog Valley, eastern Kashmir, June 2, 1892; 7,000 feet. "Bill black, base of lower mandible plumbeous; feet brownish black; irides pale brown."

Female, adult, Vale of Kashmir, May 18, 1893; 6,000 feet. "Nest and eggs of this specimen taken."

Male, adult, Vale of Kashmir, June 1, 1893. "Feet dark slate, soles pale; irides pale brown; bill black, base of lower mandible leaden; length, $5\frac{5}{8}$ inches."

Female, young, Shyok River, Ladak, July 15, 1893; 11,000 feet. "Feet leaden; irides gray; length, $5\frac{7}{8}$ inches."

Female, young, Shyok River, Ladak, July 15, 1893; 11,000 feet. "Upper mandible brownish black; lower mandible fleshy; feet leaden; length, $5\frac{5}{8}$ inches."

81. PHYLLOPSEUSTES AFFINIS (Tickell).

Male, adult, central Kashmir, July 27, 1891; 12,000 feet. Two specimens.

82. PHYLLOPSEUSTES TYTLERI (Brooks).

Female, adult, western Kashmir, July 2, 1891; 7,000 feet.

Male, adult, western Kashmir, July 6, 1891; 8,000 feet.

Mr. Brooks has verified my identification of these two specimens and notes that they are in faded summer plumage. I have no other specimens of this species for comparison, but from descriptions these birds seem to differ in their smaller size.

Measurements of Phyllopseustes tytleri.

U.S.N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
125376	Female ad.	Western Kashmir...	July 2, 1891	2.10	1.45	0.71	0.41
125377	Male ad ...	.....do.....	July 6, 1891	2.23	1.61	.70	.42

83. PHYLLOPSEUSTES TRISTIS (Blyth).

Male, adult, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Upper mandible brownish black, lower mandible pale; feet black; length, $4\frac{3}{4}$ inches."

Female, adult, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Upper mandible blackish brown, lower mandible pale brown; feet very dark brown; length, $4\frac{3}{4}$ inches."

Male, adult, Pashgam, Kashmir, June 25, 1893; 9,000 feet. "Bill black, base of lower mandible brownish yellow; feet black; soles pale; length, $4\frac{3}{8}$ inches."

Female, adult, Indus Valley, Ladak, June 30, 1893; 11,000 feet. "Bill dark horn brown, base of lower mandible yellowish brown; feet dark brown; soles yellowish; irides dark brown; length, $4\frac{1}{4}$ inches."

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The four specimens here mentioned are very difficult to place, and with the aid of description alone it is almost impossible to correctly determine them. I have no specimens of *P. sindianus*, and only three examples of the present species for comparison with Dr. Abbott's birds. The latter differ from the descriptions of *P. tristis* in a number of points: *P. tristis* is said to have a tinge of green on the upper plumage, or rump, but there is no sign of it in any of these specimens (possibly on account of the season in which they were collected): in *P. tristis* the second primary is said to be equal to, or occasionally shorter than, the seventh; in all seven of the specimens before me the second is much shorter than the seventh, and equal to the eighth or ninth: in *P. tristis* the third and fourth primaries are said to be longest; in our specimens the third, fourth and fifth are longest. In some respects the birds seem to approach *P. neglectus* or *P. sindianus;* the greater size would bar them from *neglectus*, however, and the bend of the wing, under wing-coverts and axillaries are yellowish, thus apparently distinguishing them from *P. sindianus.*

Mr. Brooks corroborates my determination, and makes the following observations: "In Pleske's work on the Birds of Prjevalski's Journeys in Central Asia (*vide* Ibis, 1895, p. 287), it is stated that *P. tristis* var. *sindiana*, and *Reguloides superciliosus* var. *mandellii* are figured on Plate II. Certainly *P. sindiana* is no variety of *P. tristis*, the voices are so utterly different. *Tristis* is a 'chiffchaff;' *sindianus* is not, but a true willow warbler, with a call like that of *P. trochilus*, but much louder and shriller. *P. mandellii* I would rather class with *P. humii* than with *P. superciliosus.* Both these birds were supposed to be resident local species, but apparently they are both migratory. There is very little known about them."

Measurements of Phyllopseustes tristis.

U.S N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150430	Male ad.....	Zogi-bul Pass	June 20	2.30	2.00	0.81	0.36
150431	Female ad ..	.....do.....	...do	2.28	1.97	.76	.36
150432	Male ad.....	Pashgam.....	June 25	2.20	1.85	.80	.34
150433	Female	Indus Valley.....	June 30	2.03	1.76	.70	.36

84. PHYLLOPSEUSTES HUMII (Brooks).

Male, adult, central Kashmir, July 23, 1891; 11,000 feet. Tail, 1.70 inches. "Faded summer bird." (W. E. B.)

Female, immature, northern slope of Pir Panjal range, Vale of Kashmir, August 21, 1891; 6,000 feet. Tail, 1.51 inches. "Apparently a young bird of the year." (W. E. B.)

Male, adult, western Kashmir, April 21, 1893; 6,000 feet. "Bill black, base of lower mandible pale; feet dark fleshy brown, soles yellowish; irides dark brown; length, 4¼ inches." "In good typical

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spring dress; they go through their spring molt in February and March." (W. E. B.)

Female, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. Tail, 1.53 inches. "Bill brownish black, pale at base of lower mandible; feet dark brown; length, 4 inches." "In faded summer dress." (W. E. B.)

The first two specimens and the last I had classed as *P. superciliosus*, not having any well authenticated specimens of the present species for comparison, but Mr. Brooks has determined them to be *P. humii;* the April male is in good plumage and its identification was not difficult.

85. PHYLLOPSEUSTES PROREGULUS (Pallas).

Female, adult, western Kashmir, July 3, 1891; 7,000 feet.

Male, immature, north side of Pir Panjal range, Kashmir, August 22, 1891; 7,000 feet.

Male, immature, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet. "Upper mandible black, lower one brown at base; feet brown; under side of toes yellow."

Male, immature, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet. "*P. humii* as far as I can make out, and probably a young bird of the year. It is not yellow enough about the head for *proregulus*, and the wing 'formula' appears to me to be that of *humii*." (W. E. B.)

Male, adult, Kaj Nag Mountains, Kashmir, April 17, 1892; 8,000 feet. "Upper mandible black; lower mandible yellow; feet dark fleshy brown, soles yellow; irides dark brown; length, $3\frac{7}{8}$ inches."

Male, adult, Kaj Nag Mountains, Kashmir, April 23, 1892; 8,000 feet. "Upper mandible black; lower mandible yellowish; feet fleshy brown, soles yellowish; irides dark brown; length, $3\frac{7}{8}$ inches."

Male, adult, Kaj Nag Mountains, Kashmir, April 23, 1892; 8,000 feet. "Feet fleshy brown; length, 4 inches."

Male, adult, Krishnagunga Valley, northwest Kashmir, May 5, 1893; 7,000 feet. "Feet fleshy brown, soles yellowish; length, $3\frac{7}{8}$ inches."

In the series of willow warblers sent to Mr. Brooks, I failed to inclose more than one or two of the specimens of this species, and he labored under the disadvantage of having no other specimens of *P. proregulus* for comparison at the time he made the identification. He determined one of the immature males to be *P. humii*, as noted above; but the specimen is in unsatisfactory condition, and not well made up. The other immature birds, collected at the same place, are easily referable to *P. proregulus;* so I think this specimen should also be placed here. It seems almost too small for *P. humii*, and the rump is partly yellow; the central crown-streak also appears to be too distinct for *P. humii*, unless this feature is exaggerated in the young of that species. The dullness of the yellow on the head mentioned by Mr. Brooks is probably on account of its immaturity.

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86. ACANTHOPNEUSTE MAGNIROSTRIS (Blyth).

Male, adult, Vale of Kashmir, August 23, 1891; 6,000 feet.
Female, adult, Vale of Kashmir, August 23, 1891; 6,000 feet.

87. ACANTHOPNEUSTE VIRIDANUS (Blyth).

Male, adult, central Kashmir, July 22, 1891; 11,000 feet.
Male, adult, central Kashmir, July 28, 1891; 11,000 feet. "Upper mandible dark brown; lower mandible light brown; feet light greenish brown above, yellow below; irides dark brown."

88. ACANTHOPNEUSTE OCCIPITALIS (Jerdon).

Female, adult, western Kashmir, July 2, 1891; 7,000 feet.
Male, adult, western Kashmir, July 3, 1891; 7,000 feet.
Male, adult, western Kashmir, July 6, 1891; 8,000 feet.
Female, adult, Lolab, Kashmir, July 11, 1891.
Male, adult, Nowboog Valley, eastern Kashmir, August 16, 1891; 7,000 feet.
Male, adult, Nowboog Valley, eastern Kashmir, May 26, 1892. "Upper mandible dark horn brown; lower mandible fleshy; feet dark fleshy brown, soles pale; irides dark brown; length, 5 inches."
Female, adult, Nowboog Valley, eastern Kashmir, May 29, 1892. "Feet fleshy brown; upper mandible dark brown; lower mandible pale yellowish brown; length, 4¾ inches."
Male, adult, Kaj Nag Mountains, Kashmir, April 25, 1892; 9,000 feet. "Upper mandible horn brown; lower mandible yellowish; feet fleshy brown, soles pale; length, 4⅞ inches."
Male, adult, Krishnagunga Valley, northwest Kashmir, May 5, 1893; 7,000 feet. "Upper mandible horn brown; lower mandible brownish yellow; feet brownish flesh, soles yellow; length, 4⅞ inches."
Male, adult, Krishnagunga Valley, Kashmir, May 6, 1893; 6,000 feet. "Upper mandible dark horn brown; lower mandible yellowish brown; feet pale horn brown, soles yellowish; length, 5 inches."
Male, adult, Sonamarg, Kashmir, June 19, 1893; 9,000 feet. "Bill horn brown above, yellowish beneath; feet fleshy brown; irides dark brown; length, 4⅞ inches."

89. CRYPTOLOPHA XANTHOSCHISTA (Gray).

Male, young, Vale of Kashmir, north slope of Pir Panjal range, August 21, 1891; 6,000 feet.
Female, adult, Sind Valley, Kashmir, April 2, 1892; 6,000 feet. "Bill black above, yellow beneath; feet pale brown; irides brown; length, 4⅝ inches."
These specimens appear to be somewhat intermediate in color and size between the above species and *C. jerdoni*. The sides of crown and nape are not concolorous with the back, nor are they dark blackish

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gray; they are only slightly darker than the back, and on the whole I think they should be referred to *C. xanthoschista*. The adult bird measures—Wing, 2.08 inches; tail, 1.67; tarsus, 0.72; culmen, 0.38: the young bird—Wing, 2.20 inches; tail, 1.80; tarsus, 0.75; culmen, 0.38.

Mr. Brooks confirms the identification of *C. xanthoschista*.

90. HORORNIS PALLIDUS (Brooks).

Male, adult, Kaj Nag Mountains, Kashmir, April 14, 1892; 7,000 feet. "Upper mandible dark horn brown; lower mandible paler; feet pale fleshy brown; irides clear brown; length, 5⅛ inches."

Male, adult, Lolab Valley, Kashmir, May 13, 1893; 6,000 feet. "Length, 4⅞ inches."

91. REGULUS REGULUS HIMALAYENSIS (Gould).

Male, adult, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet.

Male, young, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

Female, adult, central Kashmir, September 15, 1891; 10,000 feet.

Male, adult, Haramosh, Baltistan, February 25, 1892; 7,000 feet. "Bill black; tarsi dark brown; feet pale brown; irides dark brown; length, 3¾ inches."

Female, adult, Haramosh, Baltistan, February 26, 1892; 7,000 feet. "Bill black; tarsi dark brown; toes pale brown; irides dark brown; length, $3\frac{7}{16}$ inches."

This appears to be a good subspecies, paler and grayer on the back than the ordinary goldcrest of Europe.

Family TURDIDÆ.

92. PRATINCOLA MAURA (Pallas).

Male, adult, Vale of Kashmir, June 28, 1891.

Female, adult, Vale of Kashmir, June 28, 1891.

Male, adult, Vale of Kashmir, June 29, 1891.

Male, adult, Lolab Valley, Kashmir, July 12, 1891.

Male, adult, Gagangir, Sind Valley, Kashmir, March 31, 1892; 8,000 feet. "Bill and feet black; irides dark brown; length, 5⅛ inches."

Male, immature, Gagangir, Sind Valley, Kashmir, March 31, 1892; 8,000 feet. "Bill and feet black; irides dark brown; length, 5 inches."

Male, immature, Sind Valley, Kashmir, June 16, 1893; 6,000 feet. "Bill and feet black; length, 5 inches."

One of the immature males in this series is in the plumage of the female; the other differs slightly in having the bases of the buff throat feathers nearly or quite black instead of dusky gray, and a few black feathers showing on the ear coverts on one side and on the loral region of the other.

The seven specimens in this collection are apparently of one form, but they are not the same as the bird found in Korea, China and Japan,

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from which countries we have an extensive series. This latter form differs from the birds collected by Dr. Abbott in having a uniformly shorter bill, which is considerably wider at the base.

93 OREICOLA FERREA (Hodgson).

Male, adult, Nowboog Valley, eastern Kashmir, May 31, 1892; 7,000 feet. "Bill and feet black; irides dark brown; length, 5⅝ inches."

Male, adult, western Kashmir, April 21, 1893; 6,500 feet. "Bill and feet black; irides dark brown; length, 5¾ inches."

Female, adult, Lolab Valley, Kashmir, May 14, 1893; 6,000 feet.

94. SAXICOLA PICATA, Blyth.

Male, adult, Khartaksho, Indus Valley, Baltistan, March 23, 1892; 8,000 feet. "Bill and feet black; irides dark brown; length, 6½ inches."

Male, adult, Tarkuti, Indus Valley, Baltistan, March 25, 1892; 8,600 feet. "Bill and feet black; irides very dark brown; length, 6⅜ inches."

The first specimen recorded above has a grayish white forehead, inclining to almost white on the sides, and extending back toward the eye, while the crown has a grayish streaked appearance, showing an approach to *Saxicola picata capistrata* (Gould).

95. SAXICOLA PLESCHANKA, Lepechin. (?)

Male, adult, Kargil, Kashmir, June 24, 1893; 9,000 feet. "Bill and feet black; length, 6 inches."

Male, adult, Pashgam, Kashmir, June 25, 1893; 9,000 feet. "Bill and feet black; length, 6 inches."

The breeding bird of Kashmir is so much smaller than northern examples, that I very much doubt the propriety of calling the Kashmir specimens *S. pleschanka.* A dozen or more specimens obtained in Kashmir during summer are present in the National Museum series, and all are of this same small form. The much shifted name *morio* may be applicable to this Kashmir breeding bird, though I doubt it very much. Hume's *S. hendersoni* came from Yarkand, and, being a fall bird, probably belongs to the northern *S. pleschanka.* It is to be hoped that some of the experts on *Saxicola* will clear up this question.

Measurements of Saxicola pleschanka.

U.S.N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150380	Male ad...	Kargil, Kashmir	June 24	3.59	2.40	0.89	0.50
150381	Male ad...	Pashgam, Kashmir.....	June 25	3.63	2.37	.89	.50

96. SAXICOLA MONTANA, Gould.

Female, young, Leh, Ladak, July 1, 1893; 11,000 feet. "Bill and feet black; gape yellow."

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Male, adult, Leh, Ladak, July 8, 1893; 11,000 feet. "Bill and feet black; irides dark brown."

Male, adult, Fotu-la Pass, Ladak, June 27, 1893; 12,000 feet. "Bill and feet black; length, 6½ inches."

Female, young, Fotu-la Pass, Ladak, June 27, 1893; 12,000 feet. "Bill and feet black; length, 6 inches."

Female, young, Namika-la Pass, Kashmir, June 26, 1893; 12,000 feet. "Bill and feet black; gape yellow; length, 6¼ inches."

The two adult males are typical of *S. montana* as to the white on the inner webs of the wing feathers, but the dimensions are rather less than usual. These specimens and the young in first plumage confirm the presence of the species as a resident bird in Kashmir and Ladak.

Measurements of Saxicola montana.

U.S.N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150373	Male ad...	Fotu-la Pass, Ladak	June 27	3.80	2.61	1.09	0.60
150374	Male ad...	Leh, Ladak.....	July 8	3.80	2.61	1.06	.59

97. ENICURUS MACULATUS, Vigors.

Young, Vale of Kashmir, August 13, 1891.

Male, adult, Lolab Valley, Kashmir, April, 14, 1893; 5,600 feet. "Bill black; feet fleshy white; irides dark brown; length, 11 inches."

Male, adult, western Kashmir, April 21, 1893; 6,000 feet. "Bill black; feet fleshy white; irides brown; length, 10¾ inches."

98. MICROCICHLA SCOULERI (Vigors).

Female, adult, central Kashmir, October 10, 1891; 9,000 feet. "Bill black; feet pale fleshy white; length, 5¼ inches."

Female, adult, Krishnagunga Mountains, western Kashmir, April 26, 1893. "Bill black; feet fleshy white; length, 5¼ inches."

99. CHAIMARRHORNIS LEUCOCEPHALA (Vigors).

Male, adult, western Kashmir, July 8, 1891; 8,000 feet.

Female, adult, central Kashmir, July 26, 1891; 11,000 feet.

Young, central Kashmir, July 26, 1891; 11,000 feet.

Female, adult, Pir Panjal range, Kashmir, August 27, 1891; 9,000 feet.

100. PHOENICURUS FRONTALIS, Vigors.

Male, young, central Kashmir, north of Mount Haramosh, July 17, 1891; 11,000 feet.

Male, young, central Kashmir, July 23, 1891; 11,000 feet.

Male, adult, central Kashmir, July 24, 1891; 11,000 feet.

Female, adult, central Kashmir, July 25, 1891; 11,000 feet.

Male, immature, central Kashmir, September 29, 1891; 11,000 feet. "Length, 6⅛ inches."

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101. PHOENICURUS ERYTHRONOTUS (Eversmann).

Female, adult, Shigar, Baltistan, January 16, 1892; 8,000 feet. "Bill and feet black; length, 6½ inches."

102. PHOENICURUS RUFIVENTRIS (Vieillot).

Male, adult, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Bill and feet black; length, 5¾ inches."

Male, adult, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Bill and feet black; irides brown; length, 5⅞ inches."

Male, adult, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Bill and feet black; irides brown; length, 6½ inches."

Male, immature, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Bill and feet black; length, 5⅞ inches."

Male, immature, Dras, Kashmir, June 23, 1893; 10,000 feet. "Bill and feet black."

Male, young, Khardong, Ladak, July 15, 1893; 13,000 feet. "Upper mandible horn black; lower mandible horn brown; feet brownish black; length, 5¾ inches."

The immature males, which are in the garb of the female, have a few russet feathers on the lower breast; they are in rather worn plumage. The young bird is in the nestling plumage, and is described below:

Forehead, crown, nape, back, scapulars, sides of neck, throat and breast hair brown, with indistinct darker edges to the individual feathers, and somewhat lighter buffy centers to those of the throat and breast; ear-coverts and center of back of a slightly darker shade and tinged with pale Prout's brown; abdomen and flanks buff, the feathers with faint dusky edges on sides of abdomen; thighs and under tail-coverts uniform deep brownish buff; under wing-coverts buff; upper tail-coverts tawny ochraceous (as in the adult), some of the feathers with indistinct dusky tips; tail deep russet, inclining to chestnut (similar to adult male in fresh fall plumage), with the center pair of feathers blackish for their terminal two-thirds, and the narrow outer web largely deep russet, similar to the others; lesser and middle wing-coverts dusky blackish, the feathers broadly edged with isabella color; greater coverts dusky blackish, with outer webs and tips edged with pale russet; wing feathers dusky blackish, the outer webs of primaries, primary coverts, and secondaries narrowly edged with pale isabella color; tertiaries more broadly edged and tipped with pale russet, like the greater wing-coverts.

103. PHOENICURUS ERYTHROGASTER (Güldenstadt).

Male, adult, Skardu, Baltistan, November 20, 1891; 7,000 feet. "Bill and feet black; irides brown; length, 6⅞ inches."

Male, adult, Skardu, Baltistan, November 20, 1891; 7,000 feet. "Bill and feet black."

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Female, adult, Braldu Valley, Baltistan, December 23, 1891.

Male, adult, Braldu Valley, Baltistan, December 29, 1891; 9,000 feet. "Bill and feet black; irides dark brown; gape yellow; length, 7 inches."

Male, adult, Braldu Valley, Baltistan, January 2, 1892; 9,000 feet. "Bill and feet black; irides dark brown; length, 7 inches."

Female, adult, Shigar Valley, Baltistan, November 24, 1891; 8,000 feet.

Young, Sasser Pass, Ladak, July 22, 1893; 16,000 feet. "Feet black; length, 5½ inches."

The young bird from Sasser Pass is doubtless a male, as it has the white wing patch well developed. It differs from the adult male in winter plumage chiefly as follows: Upper parts dull grayish brown, lighter and with a buffy tinge on nape and rump, the feathers with dusky tips; upper tail-coverts pale russet; throat and breast grayish buff, lighter on ear-coverts and sides of neck, all the feathers with dusky tips; lower breast buff; the feathers with dusky tips; abdomen, under tail-coverts, flanks and thighs, uniform buff. Tail and wings similar to the adult male in winter plumage, but lesser wing-coverts and some of the feathers of the middle coverts are strongly tipped with buff. The white patch on the wing is not included on the primaries in this stage, from the fact that these feathers are only partly grown out.

104. RHYACORNIS FULIGINOSA (Vigors).

Female, young, eastern Kashmir, August 18, 1891; 6,000 feet.

Male, adult, central Kashmir, September 20, 1891; 9,000 feet.

Male, adult, central Kashmir, September 20, 1891; 9,000 feet.

Male, adult, Nowboog Valley, eastern Kashmir, May 30, 1892; 6,500 feet. "Bill and feet black; length, 5½ inches."

Male, adult, Nowboog Valley, eastern Kashmir, May 31, 1892; 7,000 feet. "Bill and feet black; length, 5⅛ inches."

Female, adult, Lolab Valley, Kashmir, April 20, 1893. "Bill black; feet dark fleshy brown."

105. CYANECULA SUECICA (Linnæus).

Male, adult, Skardu, Baltistan, March 18, 1892; 7,500 feet. "Bill black; feet dark fleshy brown, soles pale; length, 6 inches."

Male, adult, Gol, Indus Valley, Baltistan, March 21, 1892; 8,000 feet. "Bill black, feet dark brownish flesh; irides dark brown; length, 6 inches."

Male, adult, Pashgam, Kashmir, June 25, 1893; 9,000 feet. "Bill black, gape yellow; feet brownish black; irides dark brown; length, 5¾ inches."

Male, adult, Leh, Ladak, July 5, 1893; 12,000 feet. "Bill and feet black, gape yellow; irides dark brown; length, 5¾ inches."

Male, adult, Nubra Valley, Ladak, July 18, 1893; 11,000 feet. "Bill and feet black; length, 5¾ inches."

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Three of the specimens in this series, those collected in June and July, have a slight admixture of white on the lower border of the russet patch on the throat, and the basal half of each russet feather is white. These birds are in worn summer plumage, and in only one of the examples is there any trace of russet on the lower breast. In two of the specimens, from Leh and Pashgam, and in a March specimen from Skardu, the lores are tinged with blue; in looking over our series of this species, I find a specimen from Norway also with blue on the lores. In the two Baltistan birds, collected in March, the russet patch is without white at the base.

106. CYANECULA ABBOTTI, new species.

Forehead, crown (except sides), nape, back, scapulars and rump, uniform deep hair brown; sides of neck similar, but paler and more ashy; lores grayish blue, whitish above; superciliary line distinct, whitish, tinged with blue from the lores posteriorly to a point over the eyes; sides of crown bordering superciliary line clove brown; ear-coverts light dusky gray, with streaks of hair brown; throat and malar region blue (between campanula and cobalt blue), with a spot of silky white below the center; blue of throat bordered below by a band of black (with a bluish tinge); this is succeeded by a narrow, broken, almost obsolete band of white, which in turn is followed by a band of russet; rest of lower breast, abdomen, and under tail coverts white, some of the feathers of the latter with pale russet centers; sides of body and flanks wood brown; thighs hair brown. Wing feathers dark dusky brown, with narrow lighter edgings on the external webs; lesser wing-coverts grayish brown (like sides of neck), the feathers with darker centers; middle and greater coverts and primary coverts dark dusky brown like wing feathers, with lighter edgings on the external webs; under wing-coverts and axillaries buff; under primary coverts pale cream buff. Middle pair of tail feathers brownish black; four outer pairs russet for their basal two-thirds, terminal third black; second pair from middle similar to the four outer pairs, but the black on inner web extends a half inch nearer the base; upper tail-coverts dark grayish brown (darker and grayer than back and rump), some of the feathers with russet centers and shafts. Wing, 2.86 inches; tail, 2.31; tarsus, 1.07; middle toe (without claw), 0.58; exposed culmen, 0.52. "Length, 5¾ inches; bill and feet black, soles yellowish; irides brown."

Type.—No. 150370, U.S.N.M. Male, adult; Nubra Valley, Ladak, July 16, 1893; 10,000 feet; Dr. W. L. Abbott, collector.

This interesting bird, of which Dr. Abbott has sent three specimens, is very closely related to the White-spotted Bluethroat, *Cyanecula wolfii* (Brehm), but differs from it in the deeper blue of the throat, in the blue lores, and in the longer bill, which latter character is more easily seen on comparison of specimens than expressed in figures. The specimens are in somewhat worn breeding plumage, which probably accounts for the grayer color of the upper parts and ear coverts, and the more

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restricted russet band on breast (almost obsolete in one of the examples), when compared with specimens of *C. wolfii* in fresh plumage. It is very interesting to note that *C. suecica* and the present species are both resident in the Nubra Valley, at the same altitude, as shown by Dr. Abbott's specimens, and as previously recorded by Dr. Sharpe,[1] and in one of our specimens of the new form we find two or three of the silky white feathers composing the throat patch to have faint traces of russet. On the other hand, as recorded under the preceding species, some of the examples of that species from this region have white on the throat patch, and a tinge of blue on the lores; they are, however, certainly referable to *C. suecica*, and not the present species. The three specimens of the new form have the bills, tarsi and feet black; more so than in any specimens of *C. wolfii* in the National Museum collection.

White-spotted Bluethroats have several times been recorded from Ladak and Kashmir as the ordinary *C. wolfii*, but it is probable that all the resident birds of this region are referable to the form here described. Major Biddulph has found it in the Nubra Valley in June, and at Gilgit, Kashmir, in April,[2] and Hume[3] writes, "In the interior of the Himalayas, north of Ley and the Indus, many specimens have been met with."

Measurements of Cyanecula abbotti.

U.S.N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Exposed culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150370	Male ad.....	Nubra Valley	July 16	2.86	2.21	1.07	*0.52
150371	Male ad.....	.....do.....	July 17	2.80	2.16	1.08	†.54
150372	Male ad.....	.....do.....	July 18	2.80	2.24	1.11	‡.51

* "Length, 5¾ inches." † "Length, 5⅝ inches." ‡ "Length, 5⅝ inches."

Measurements of Cyanecula wolfii.

U.S.N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Exposed culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
77780	Male ad.....	Heligoland.....	Apr. —	2.80	2.02	1.06	.47
115625	Male ad.....	Nice	Apr. —	3.08	2.37	1.09	.49
115624	Male ad.....	.....do.....	Apr. —	2.87	2.21	1.07	.47

107. MELODES PECTORALIS (Gould).

Female, adult, Mount Montir, Kashmir, July 16, 1891; 10,000 feet.

Male, adult, central Kashmir, July 23, 1891; 11,000 feet.

Female, adult, central Kashmir, July 24, 1891; 11,000 feet.

Male, adult, central Kashmir, July 28, 1891; 12,000 feet. "Bill and feet black; irides dark brown."

Male, adult, Zogi-bul Pass, Kashmir, June 20, 1893; 11,000 feet. "Bill black; feet brownish black; length, 6⅛ inches."

[1] Second Yarkand Mission, London, 1891: Aves, p. 90.

[2] The Ibis, 1881, p. 65.

[3] Stray Feathers, VII, 1878, p. 392.

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108. IANTHIA RUFILATA (Hodgson).

Male, adult, central Kashmir, July 23, 1891; 11,000 feet.

Female, adult, central Kashmir, July 23, 1891; 12,000 feet.

Female, adult, central Kashmir, July 23, 1891; 11,000 feet; two specimens.

Male, immature, central Kashmir, July 24, 1891; 11,000 feet.

Male, adult, central Kashmir, July 28, 1891; 11,000 feet. "Bill and feet black; irides dark brown."

Male, immature, central Kashmir, July 28, 1891; 12,000 feet.

Young, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

Male, adult, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet. "Length, 5¾ inches."

Male, young, western Kashmir, September 11, 1891; 9,000 feet.

An adult male from central Kashmir has a distinct spot of silky white feathers in the blue superciliary line, just posterior to the eyes; the plumage is otherwise quite normal.

109. MERULA MERULA MAXIMA (Seebohm).

Female, adult, central Kashmir, July 22, 1891; 11,000 feet.

Female, adult, central Kashmir, July 27, 1891; 12,000 feet.

These specimens are in very abraded summer plumage, and were doubtless resident and breeding in central Kashmir. They bear out Mr. Seebohm's original measurements and point to the higher altitudes as the summer home of this form. It is quite probable that this bird does not range very far north of Kashmir, as the birds of eastern Turkestan are referable to a form intermediate between this one and the common Blackbird of Europe. The Abbott specimens, though much abraded, give the following measurements:

Measurements of Merula merula maxima.

U.S.N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Exposed culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
125490	Female ad..	Central Kashmir.....	July 22	5.82	5.07	1.40	0.96
125489	Female ad..	.....do.....	July 27	5.89	4.73	1.40	.96

Mr. Seebohm's measurements of the Jerdon Kashmir specimen are: Wing, 5.85 inches; tail, 4.90; tarsus, 1.50; culmen, 0.95.

110. MERULA CASTANEA, Gould.

Male, adult, western Kashmir, July 3, 1891; 7,000 feet.

Male, adult, western Kashmir, July 6, 1891; 8,000 feet.

Male, adult, Lolab, Kashmir, July 12, 1891; 6,000 feet.

Female, adult, Kaj Nag Mountains, Kashmir, April 23, 1892; 8,000 feet. "Bill yellow; feet dirty yellow; length, 10¾ inches."

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111. MERULA ATROGULARIS (Temminck).

Male, immature, Sind Valley, Kashmir, November 5, 1891; 6,000 feet. "Occurring in large flocks at the present time, especially in the mountains."

Male, adult, Indus Valley, Baltistan, November 18, 1891; 8,000 feet. "Bill dark horn brown; lower mandible yellowish at base; tarsi pale flesh color; toes dark; length, 10⅜ inches."

Female, adult, Braldu Valley, Baltistan, December 31, 1891; 9,000 feet. "Bill dark horn brown; lower mandible yellowish at base; feet fleshy brown; irides dark brown; length, 9⅞ inches."

Female, adult, Shigar, Baltistan, January 20, 1892; 8,000 feet. "Bill black; lower mandible yellow at base; feet brownish flesh; irides dark brown; length, 9¾ inches."

Female, adult, Skardu, Baltistan, January 27, 1892; 7,000 feet. "Upper mandible dark horn brown, lower mandible yellowish toward gape; irides dark brown; length, 10 inches; feet pale brownish flesh."

Male, adult, Skardu, Baltistan, March 18, 1892; 7,500 feet. "Tarsi pale fleshy brown; toes dark fleshy brown; upper mandible horn brown, yellow along gape; lower mandible yellow, brown at tip; irides dark brown; length, 10¼ inches."

Male, adult, Srinagar, Kashmir, April 4, 1892; 5,200 feet. "Upper mandible brownish black, becoming yellow at gape; lower mandible black at tip, the rest dull yellow; feet fleshy brown; irides brown; length, 10⅜ inches."

Female, adult, Kaj Nag Mountains, Kashmir, April 14, 1892; 7,000 feet. "Bill dark horn brown; lower mandible yellow at base; tarsi pale fleshy brown; toes dark fleshy brown; length, 9¾ inches."

112. MERULA UNICOLOR (Tickell).

Male, adult, Vale of Kashmir, June 25, 1891; two specimens.

Female, adult, Vale of Kashmir, June 29, 1891.

Male, adult, Sopor, Vale of Kashmir, April 11, 1892; 5,200 feet. "Bill yellow; feet yellowish brown; irides dark brown; length, 9 inches."

Male, adult, eastern Kashmir, August 19, 1891.

Male, adult, Lolab Valley, Kashmir, July 12, 1891.

Male, adult, Lolab Valley, May 12, 1893; 6,000 feet. "Bill orange yellow; feet brownish yellow; length, 9¼ inches."

113. TURDUS VISCIVORUS HODGSONI (Homeyer).

Male, adult, western Kashmir, September 11, 1891; 8,000 feet. "Bill dark brown, lower mandible lighter at base; feet yellowish brown, claws nearly black."

Male, adult, central Kashmir, September 13, 1891; 10,000 feet. "Bill dark brown; feet yellowish brown; length, 11¾ inches."

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114. OREOCINCLA DAUMA (Latham).

Male, adult, western Kashmir, July 3, 1891; 7,000 feet.

115. PETROPHILA CINCLORHYNCHA (Vigors).

Male, adult, Lolab Valley, Kashmir, May 15, 1893; 6,000 feet. "Bill black, gape yellow; irides dark brown; feet dark fleshy brown; soles yellowish; length, 7¾ inches."

116. PETROPHILA SOLITARIA (Linnæus.)

Male, adult, Sonamarg, Sind Valley, Kashmir, June 18, 1893; 9,000 feet. "Bill and feet black; irides hazel; length, 9⅝ inches."

Male, adult, Dras Valley, Kashmir, June 21, 1893; 10,000 feet. "Bill and feet black; length, 8¾ inches."

Female, adult, Dras, Kashmir, June 23, 1893; 10,000 feet. "Bill black; feet blackish brown; irides clear brown; length, 8½ inches."

117. MONTICOLA SAXATILIS (Linnæus).

Male, immature, central Kashmir, September 22, 1891; 11,000 feet. "Upper mandible dark horn brown; lower mandible dark horn brown at tip, becoming lighter at base; length, 7¾ inches."

Family CINCLIDÆ.

118. CINCLUS CINCLUS CASHMIRIENSIS (Gould).

Female, adult, Braldu Valley, Baltistan, December 10, 1891; 10,500 feet. "Bill black; tarsi pale leaden in front, dark brown behind; soles of feet pale; irides clear brown; length, 7⅝ inches; extent, 11⅜ inches."

Female, adult, Braldu Valley, Baltistan, December 10, 1891; 10,500 feet. "Tarsi leaden in front, dark brown behind; length, 7⅝ inches. Shot while running about upon the ice, apparently perfectly at home."

Female, adult, Braldu Valley, Baltistan, December 10, 1891; 10,500 feet. "Bill dark horn brown; feet dark brown, except front of tarsi, where pale."

Female, adult, Shigar, Baltistan, January 16, 1892; 8,000 feet. "Bill almost black; front of tarsi brownish, darker behind; top of toes leaden; irides clear hair brown; length, 7⅛ inches."

Male, adult, Leh, Ladak, July 5, 1893; 12,000 feet. "Bill black; front of tarsi and top of toes pale leaden; back of tarsi dark brown; soles grayish; irides clear brown; length, 8¼ inches."

119. CINCLUS ASIATICUS, Swainson.

Female, young, western Kashmir, July 8, 1891; 8,000 feet.

Female, young, central Kashmir, September 20, 1891; 9,000 feet.

Female, adult, Indus Valley, Baltistan, November 15, 1891; 9,000

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feet. "Bill black; front of feet leaden, dusky behind, soles paler; length, 7¾ inches."

Male, adult, Indus Valley, Baltistan, November 17, 1891; 8,000 feet.

Female, adult, Indus Valley, Baltistan, November 17, 1891; 8,000 feet. "Bill very dark horn, nearly black; feet pale leaden, darker behind, soles whitish; length, 7⅞ inches."

Male, adult, Braldu Valley, Baltistan, December 26, 1891; 9,000 feet. "Bill black; irides clear brown; front of tarsi leaden, black behind; length, 8½ inches."

Female, adult, Braldu Valley, Baltistan, December 28, 1891; 9,000 feet. "Bill black; irides clear brown; tarsi and upper surface of toes leaden; back of tarsi black; soles yellowish; length, 8 inches."

Female, adult, Rondu, Baltistan, January 31, 1892; 7,000 feet. "Bill black; tarsi and upper surface of toes leaden, black behind; irides hair brown; length, 7¾ inches. Excessively fat."

Male, adult, Sind Valley, Kashmir, April 1, 1892; 7,000 feet. "Bill black; tarsi pale leaden in front, dark leaden behind; soles pale; irides brown; length, 8½ inches."

Family TROGLODYTIDÆ.

120. TROGLODYTES NIPALENSIS NEGLECTUS (Brooks).

Male, adult, central Kashmir, July 23, 1891; 11,000 feet.

Female, adult, central Kashmir, July 24, 1891, 11,000 feet.

Male, adult, central Kashmir, July 24, 1891; 11,000 feet.

Male, immature, Pir Panjal Range, Kashmir, August 29, 1891; 9,000 feet. "Length, 3¾ inches."

Male, adult, Indus Valley, Baltistan, November 16, 1891; 8,000 feet. "Upper mandible dark brown; lower mandible light brown; feet dark brownish flesh color; length, 3¾ inches."

Female, adult, Indus Valley, Baltistan, November 16, 1891; 8,000 feet. "Length, 3⅞ inches."

Male, adult, Braldu Valley, Baltistan, December 28, 1891; 9,000 feet. "Length, 3⅞ inches."

Male, adult, Braldu Valley, Baltistan, January 2, 1892; 9,000 feet. "Upper mandible dark brown; lower mandible pale brown; irides dark brown; length, 3⅞ inches."

Family ACCENTORIDÆ.

121. ACCENTOR COLLARIS RUFILATUS, Sharpe.

Male, adult, Indus Valley, Baltistan, November 15, 1891; 9,000 feet.

Male, adult, Indus Valley, Baltistan, November 16, 1891; 8,000 feet. "Upper mandible black except at gape, where yellow; lower mandible black at tip, base yellow; feet reddish flesh color, soles yellowish; irides brown; length, 6¾ inches."

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Female, adult, Rondu, Baltistan, February 4, 1892; 6,000 feet. "Bill black, except base of lower mandible, which is yellow; feet pale reddish brown; irides reddish brown; length, 6⅜ inches."

Male, adult, Haramosh, Baltistan, March 4, 1892; 7,000 feet. "Upper mandible black, with yellow spot at gape; lower mandible black at tip, the rest yellow; feet pale reddish brown, soles yellow; irides clear reddish brown; length, 6⅞ inches."

Measurements of Accentor collaris rufilatus.

U.S.N.M. No.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
126801	Male ad...	Indus Valley, Kashmir....	Nov. 15	3.75	2.58	0.94	0.55
126800	Male ad...	.....do.....	Nov. 16	3.83	2.71	.97	.56
126802	Female ad..	Rondu, Baltistan.....	Feb. 4	3.51	2.47	.94	.51
126799	Male ad...	Haramosh, Baltistan	Mar. 4	3.80	2.63	.97	.56

122. ACCENTOR HIMALAYANUS, Blyth.

Female, adult, central Kashmir, September 22, 1891; 11,000 feet. "Feet yellowish brown; bill black, lower mandible yellowish at base; irides reddish brown."

Female, adult, central Kashmir, September 24, 1891; 11,000 feet. "Feet brownish flesh color; bill black; length, 6⅛ inches."

123. PRUNELLA FULVESCENS (Severtzoff).

Female, adult, Indus Valley, Baltistan, November 16, 1891; 8,000 feet. "Bill black; feet pale reddish flesh color; irides red brown; length, 6 inches."

Female, adult, Indus Valley, Baltistan, November 15, 1891; 9,000 feet.

Adult, Shigar Valley, Baltistan, November 22, 1891; 7,500 feet.

Male, adult, Braldu Valley, Baltistan, January 2, 1892; 9,000 feet. "Bill black; feet brownish flesh color; irides clear hair brown; length, 6⅛ inches."

Male, adult, Shigar, Baltistan, January 16, 1892; 8,000 feet. "Bill black; feet pale reddish brown; irides clear brown; length, 6⅛ inches."

Female, adult, Shigar, Baltistan, January 20, 1892; 8,000 feet. "Bill black; feet pale reddish brown; irides clear brown; length, 5⅞ inches."

Female, adult, Shigar, Baltistan, January 24, 1892; 8,000 feet. "Bill black, whitish at gape; feet pale reddish brown; length, 6⅛ inches."

Female, adult, Haramosh, Baltistan, February 5, 1892; 7,000 feet. "Bill black; feet pale fleshy brown; irides brown."

124. PRUNELLA ATRIGULARIS (Brandt).

Male, adult, Sind Valley, Kashmir, November 8, 1891; 9,000 feet.

Male, adult, Braldu Valley, Baltistan, December 30, 1891; 9,000 feet.

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"Bill black, gape whitish; irides hair brown; feet brownish flesh color; length, 6¼ inches."

Female, adult, Haramosh, Baltistan, February 16, 1892; 5,000 feet. "Bill black; feet brownish flesh; irides brown; length, 6⅛ inches."

125. PRUNELLA RUBECULOIDES (Moore).

Male, adult, Braldu Valley, Baltistan, December 30, 1891; 9,000 feet. "Bill black; feet reddish flesh; irides reddish brown; length, 6½ inches."

Female, adult, Khardong Pass, Ladak, July 14, 1893; 16,000 feet. "Bill black; feet pale reddish brown, claws black; irides pale brown; length, 6⅛ inches."

Male, adult, Khardong, Ladak, July 15, 1893; 13,000 feet. "Bill black; feet pale reddish brown; irides pale brown; length, 6⅜ inches."

Male, adult, Sasser Pass, Ladak, July 20, 1893; 16,000 feet. "Bill black; feet pale reddish flesh color; length, 6⅜ inches."

126. PRUNELLA JERDONI (Brooks).

Male, adult, central Kashmir, July 23, 1891; 11,000 feet.

Female, adult, central Kashmir, July 26, 1891; 12,000 feet.

Female, adult, central Kashmir, July 29, 1891; 12,000 feet.

Immature, central Kashmir, September 13, 1891; 10,000 feet.

Female, adult, central Kashmir, September 30, 1891; 10,000 feet.

Male, adult, Gund, Sind Valley, Kashmir, April 1, 1892; 7,000 feet. "Bill black; feet pale fleshy brown; irides reddish brown; length, 5¾ inches."

Female, adult, Lolab Valley, Kashmir, May 13, 1893; 6,000 feet. "Length, 5¼ inches."

Some of the above specimens, notably one from central Kashmir, show streaks on the crown, indicating an approach to *Prunella strophiatus*, with which it may some day be found to intergrade.

Family TIMELIIDÆ.

127. TROCHALOPTERON LINEATUM (Vigors).

Female, adult, Mount Montir, central Kashmir, July 15, 1891; 8,000 feet.

Male, adult, north slope of Pir Panjal range, Vale of Kashmir, August 21, 1891; 6,000 feet. "Upper mandible dark brown; lower mandible pale flesh color; feet brown."

Female, adult, Vale of Kashmir, November 4, 1891; 5,000 feet.

Male, adult, Vale of Kashmir, November 4, 1891; 5,000 feet. "At this season one of the commonest and most familiar birds."

Female, adult, Braldu Valley, Baltistan, December 27, 1891; 9,000 feet. "Bill dark fleshy brown above, pale below; feet pale brownish flesh; irides reddish brown; length, 8⅜ inches."

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Male, adult, Braldu Valley, Baltistan, January 3, 1892; 9,000 feet. "Upper mandible dark horn brown; lower mandible pale brown; feet brownish flesh; irides brown; length, 8½ inches."

128. MYOPHONUS TEMMINCKII (Vigors).

Female, adult, western Kashmir, July 5, 1891; 7,000 feet. "Lower mandible yellow."

Male, immature, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

Female, immature, Pir Panjal range, Kashmir, August 31, 1891; 7,000 feet.

Male, adult, Rondu, Baltistan, February 2, 1892; 6,000 feet. "Upper mandible black; yellow along commissure; lower mandible yellow; irides brown; length, 13¼ inches."

129. LARVIVORA BRUNNEA, Hodgson.

Male, adult, Krishnagunga Valley, Kashmir, May 6, 1893; 6,000 feet. "Bill black; feet pale fleshy brown; irides brown; length, 5⅜ inches."

Male, adult, Krishnagunga Valley, Kashmir, May 10, 1893; 7,000 feet. "Bill black; feet pale brownish flesh; length, 5⅜ inches."

Family PYCNONOTIDÆ.

130. HYPSIPETES PSAROIDES, Vigors.

Female, adult, Lolab, Kashmir, July 10, 1891. "Bill dark red; feet red."

Male, adult, Lolab Valley, Kashmir, July 12, 1891; 6,000 feet.

Female, adult, north slope of Pir Panjal range, Kashmir, August 22, 1891; 7,000 feet. "Bill coral red; feet orange red; irides dark brown."

131. MOLPASTES LEUCOGENYS (Gray).

Male, adult, Lolab, Kashmir, July 1, 1891.

Male, adult, Lolab Valley, Kashmir, July 10, 1891; 6,000 feet.

Male, adult, Vale of Kashmir, August 9, 1891.

Female, adult, Vale of Kashmir, August 9, 1891.

Family CAMPOPHAGIDÆ.

132. PERICROCOTUS BREVIROSTRIS (Vigors).

Female, adult, western Kashmir, July 7, 1891; 8,000 feet.

Male, adult, Lolab Valley, Kashmir, July 11, 1891; 6,000 feet.

Male, adult, Lolab Valley, Kashmir, July 12, 1891.

Female, immature, Lolab, Kashmir, September 10, 1891; 8,000 feet.

Male, adult, central Kashmir, August 2, 1891; 9,000 feet. "Length, 7⅞ inches."

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Male, adult, Vale of Kashmir, August 14, 1891. "Length, 8 inches."

Female, adult, Vale of Kashmir, north slope of Pir Panjal Range, August 21, 1891; 6,000 feet. "Length, 7¾ inches."

Family MUSCICAPIDÆ.

133. HEMICHELIDON SIBIRICA (Gmelin).

Male, adult, Lolab, Kashmir, July 1, 1891.

Female, adult, western Kashmir, July 7, 1891; 8,000 feet.

Female, adult, central Kashmir, July 26, 1891; 11,000 feet.

Female, immature, western Kashmir, September 11, 1891; 9,000 feet.

Male, adult, Vale of Kashmir, May 29, 1893. "Bill brownish black; lower mandible yellowish brown at base; feet black; irides dark brown; length, 4¾ inches."

Male, adult, Lolab Valley, Kashmir, May 13, 1894; 7,000 feet. "Length, 4¾ inches."

134. SIPHIA HYPERYTHRA, Cabanis.

Male, adult, Lolab, Kashmir, July 10, 1891.

Male, young, Lolab, Kashmir, July 10, 1891.

Male, adult, Lolab Valley, Kashmir, May 12, 1893; 6,000 feet. "Upper mandible dark horn brown; lower mandible brownish yellow· feet dark fleshy brown; length, 4⅞ inches."

Young, Vale of Kashmir, August 20, 1891; 6,000 feet.

Male, adult, Vale of Kashmir, April 27, 1892; 6,000 feet. "Upper mandible dark horn brown; lower mandible yellowish brown; irides clear brown; feet blackish brown; length, 5¼ inches."

Female, adult, north slope of Pir Panjal range, Kashmir, August 22, 1891; 7,000 feet.

135. CYORNIS SUPERCILIARIS (Jerdon).

Male, adult, western Kashmir, July 2, 1891; 7,000 feet.

Male, adult, western Kashmir, July 3, 1891; 7,000 feet.

Male, adult, Kaj Nag Mountains, Kashmir, April 25, 1892; 9,000 feet. "Bill and feet black; irides blackish brown; length, 4⅞ inches."

Female, adult, Lolab Valley, Kashmir, April 20, 1893. "Bill and feet black; irides dark brown."

Female, adult, Lolab Valley, Kashmir, May 12, 1893; 6,000 feet. "Bill and feet black."

136. CYORNIS LEUCOMELANURUS (Hodgson).

Male, immature, Nowboog Valley, eastern Kashmir, May 29, 1892; 7,000 feet. "Bill black; irides blackish brown; length, 4¾ inches; feet blackish brown."

Male, adult, Nowboog Valley, Kashmir, May 31, 1892; 7,000 feet. "Bill black; irides dark brown; feet dark fleshy brown; length, 4¾ inches"

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Male, adult, Krishnagunga Valley, northwest Kashmir, May 5, 1893; 7,000 feet. "Bill black; feet brownish black; length, 4¾ inches."

137. STOPAROLA MELANOPS (Vigors).

Male, adult, Lolab Valley, Kashmir, May 12, 1893; 6,000 feet. "Bill and feet black; irides dark brown; length, 6⅛ inches."

Male, adult, Vale of Kashmir, May 29, 1893. "Bill and feet black; irides dark brown; length, 6½ inches."

138. ALSEONAX RUFICAUDUS (Swainson).

Female, adult, western Kashmir, July 7, 1891; 8,000 feet.

Male, adult, western Kashmir, July 7, 1891; 8,000 feet.

Male, adult, Lolab Valley, Kashmir, May 14, 1893; 6,000 feet. "Upper mandible black; lower mandible yellowish brown; feet dark fleshy brown; length, 5⅜ inches."

Male, adult, Nowboog Valley, eastern Kashmir, May 29, 1892; 7,000 feet. "Upper mandible dark brown; lower mandible pale brown; feet very dark brown; length, 5¾ inches."

Male, adult, Krishnagunga Valley, Kashmir, May 6, 1893; 6,000 feet. "Upper mandible dark horn brown; lower mandible yellowish brown; feet dark fleshy brown; length, 5½ inches."

Male, adult, Krishnagunga Valley, Kashmir, May 6, 1893; 6,000 feet. "Upper mandible black; lower mandible pale brownish horn; feet dark fleshy brown; length, 5¾ inches."

139. TERPSIPHONE PARADISI (Linnæus).

Male, adult, Lolab, Kashmir, July 9, 1891.

Male, adult, Vale of Kashmir, August 8, 1891.

Adult, Vale of Kashmir, May, 1892. Three specimens.

Family HIRUNDINIDÆ.

140. HIRUNDO URBICA, Linnæus.

Female, adult, Kharbu, Kashmir, June 26, 1893; 12,000 feet. "Bill black; length, 5⅝ inches."

Male, adult, Indus Valley, Ladak, June 28, 1893; 10,000 feet. "Bill black; irides brown; claws pale brown; length, 5½ inches. Common along the Indus."

141. HIRUNDO CASHMERIENSIS (Gould).

Female, adult, Atchibal, Vale of Kashmir, May 26, 1892.

142. PTYONOPROGNE RUPESTRIS (Scopoli).

Male, adult, Khartaksho, Indus Valley, Baltistan, March 23, 1892; 8,000 feet. "Bill horn black; feet pale brownish flesh; irides dark brown; length, 5¾ inches."

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Female, adult, Khartaksho, Indus Valley, Baltistan, March 23, 1892; 8,000 feet. "Bill horn black; feet pale fleshy brown; irides dark brown; length, 5⅞ inches."

Female, adult, Dras Valley, Kashmir, June 21, 1893; 10,000 feet. "Bill black; feet flesh color; length, 6⅛ inches."

143. CHELIDON RUSTICA (Linnæus).

Male, adult, Vale of Kashmir, August 9, 1891.

Female, immature, Vale of Kashmir, August 4, 1891.

Male, adult, Vale of Kashmir, August 9, 1891.

Male, immature, Vale of Kashmir, August 9, 1891

Male, immature, Vale of Kashmir, August 24, 1891.

Female, adult, Gunderbal, Vale of Kashmir, April 2, 1892. "Bill and feet black; irides brown; length, 7½ inches."

Male, adult, Gunderbal, Vale of Kashmir, April 2, 1892. "Bill and feet black; irides brown; length, 7¼ inches."

Male, adult, Vale of Kashmir, May, 1892.

Female, adult, Srinagar, Kashmir, April 3, 1892. "Bill and feet black; irides dark brown; length, 7¼ inches."

144. CHELIDON ERYTHROPYGIA (Sykes).

Male, adult, Vale of Kashmir, May 18, 1893; 6,000 feet. "Bill black; feet dark fleshy brown; irides dark brown; length, 7½ inches."

Female, adult, Vale of Kashmir, May 18, 1893; 6,000 feet. "Bill black; feet dark fleshy brown; irides dark brown; length, 6⅞ inches."

Family PICIDÆ.

145. GECINUS SQUAMATUS (Vigors).

Male, adult, Lolab Valley, Kashmir, July 12, 1891.

Male, adult, Haramosh, Baltistan, February 22, 1892; 6,000 feet. "Bill yellow, base of culmen horn color; feet greenish leaden; irides carmine, with a paler circle; length, 14; extent, 20¾ inches. Only one pair observed. Kashmir name *Kūl ká kūr* (literally, tree popper)."

146. DRYOBATES HIMALAYENSIS (Jardine and Selby).

Female, immature, western Kashmir, July 6, 1891; 8,000 feet.

Male, immature, western Kashmir, July 7, 1891; 8,000 feet.

Male, western Kashmir, July 7, 1891; 8,000 feet.

Male, adult, Lolab, Kashmir, July 10, 1891.

Female, immature, central Kashmir, August 2, 1891; 9,000 feet.

Immature, central Kashmir, August 2, 1891; 9,000 feet.

Female, immature, Vale of Kashmir, August 12, 1891.

Female, adult, Nowboog Valley, eastern Kashmir, August 15, 1891; 7,000 feet.

Male, adult, Pir Panjal range, Kashmir, August 27, 1891; 8,000 feet.

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Female, adult, Haramosh, Baltistan, February 13, 1892; 9,000 feet. "Bill black, base of lower mandible slaty; feet slaty; length, 9⅝ inches. Only specimen observed in this region."

The specimens marked immature females, all have red crowns, like the immature males, but in one of them the crown is almost black, only a few scattered red feathers being present.

147. DRYOBATES AURICEPS (Vigors).

Female, adult, Lolab Valley, Kashmir, July 12, 1891.

Female, adult, Lolab Valley, Kashmir, April 20, 1893. "Feet greenish slate; bill horn black."

148. JYNX TORQUILLA, Linnæus.

Female, adult, eastern Kashmir, August 15, 1891; 7,000 feet. "Bill brown; feet dark greenish flesh color; irides light orange brown."

Male, adult, Vale of Kashmir (western part), April 13, 1892. "Bill horn brown; feet slaty, with greenish tinge; length, 7⅝ inches."

Male, adult, Vale of Kashmir, western part, April 13, 1892; 5,500 feet. "Bill horn brown; feet dirty yellow, claws brown; irides pale brown."

Male, adult, Vale of Kashmir, April 14, 1893. "Feet pale fleshy brown, with greenish tinge, claws horn color; bill horn color, dark at tip; irides pale brown; length, 7⅝ inches."

Family UPUPIDÆ.

149. UPUPA EPOPS, Linnæus.

Male, adult, Vale of Kashmir, June 22, 1891.

Female, adult, Vale of Kashmir, August 10, 1891.

Female, adult, eastern Kashmir, August 18, 1891; 6,000 feet.

Family CUCULIDÆ.

150. CUCULUS CANORUS TELEPHONUS (Heine).

Male, immature, Vale of Kashmir, September 1, 1891. "Feet pale yellow; length, 13¼ inches. Extremely fat."

Female, immature, Vale of Kashmir, August 10, 1891. "Bill black; base of lower mandible yellowish green; irides pale brownish; feet yellow; length, 12 inches."

Male, adult, Vale of Kashmir, April 27, 1892; 6,000 feet. "Bill black; base of lower mandible greenish yellow; orbital skin orange; irides orange; length, 13¼ inches."

Male, adult, Vale of Kashmir, April 27, 1892; 6,000 feet. "Bill black; lower mandible greenish yellow at base; orbital skin orange; irides orange; feet bright yellow; length, 13¾ inches."

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151. CUCULUS POLIOCEPHALUS, Latham.

Male, adult, Lolab Valley, Kashmir, May 15, 1893; 6,000 feet. "Bill black; base of lower mandible yellowish brown; orbital skin lemon yellow; irides brown; feet lemon yellow; length, 10⅞ inches."

152. COCCYSTES JACOBINUS (Boddaert).

Female, adult, Vale of Kashmir, August 12, 1891. "Length, 12⅜ inches."

Female, immature, Vale of Kashmir, August 13, 1891.

Male, adult, Vale of Kashmir, August 24, 1891. "Feet leaden blue; bill black; irides dark brown; length, 12¼ inches."

Male, immature, Vale of Kashmir, September 1, 1891. "Feet leaden blue; irides brown; upper mandible black; lower mandible yellowish brown."

Family ALCEDINIDÆ.

153. ALCEDO ISPIDA BENGALENSIS (Gmelin).

Male, adult, Lolab, Kashmir, July 1, 1891.

Male, adult, Lolab, Kashmir, July 9, 1891.

Male, adult, Lolab, Kashmir, July 10, 1891.

Male, adult, Srinagar, Kashmir, August 4, 1891. "Length, 7⅛ inches."

Adult, no data.

154. CERYLE RUDIS VARIA (Strickland).

Male, adult, Vale of Kashmir, August 13, 1891. Three specimens.

Female, adult, Vale of Kashmir, August 13, 1891.

Family MICROPODIDÆ.

155. MICROPUS APUS PEKINENSIS (Swinhoe).

Female, adult, Vale of Kashmir, June 2, 1893. "Bill and claws black; feet dark fleshy brown; length, 7 inches."

Male, adult, Dras, Kashmir, June 22, 1893; 10,000 feet. "Bill black; length, 7 inches."

Family CORACIIDÆ.

156. CORACIAS GARRULA, Linnæus.

Male, adult, Vale of Kashmir, June 28, 1891.

Female, adult, Lolab, Kashmir, July 10, 1891; 6,000 feet.

Male, immature, eastern Kashmir, August 18, 1891; 6,000 feet.

Family MEROPIDÆ.

157. MEROPS APIASTER, Linnæus.

Female, adult, Vale of Kashmir, August 9, 1891.

Male, adult, Vale of Kashmir, August 10, 1891. "Bill black; feet leaden; irides brown."

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Family PSITTACIDÆ.

158. PALÆORNIS SCHISTICEPS, Hodgson.

Male, immature, Lolab Valley, Kashmir, July 1, 1891.

Male, adult, Lolab Valley, Kashmir, July 10, 1891; 6,000 feet. "Upper mandible red, yellow at tip; lower mandible yellow; feet slate; irides white."

Male, adult, Lolab Valley, Kashmir, July 10, 1891.

Male, immature, Lolab Valley, Kashmir, July 12, 1891.

Male, adult, Vale of Kashmir, August 22, 1891; 6,000 feet. "Upper mandible red at base, yellow at tip, as is lower mandible; cere orange; irides yellowish white; feet dirty yellowish brown; length, 19¼ inches."

Immature, Vale of Kashmir, August 23, 1891; 6,000 feet. "Bill yellow; feet greenish brown."

Family COLUMBIDÆ.

159. COLUMBA INTERMEDIA, Strickland.

Male, adult, Dras Valley, Kashmir, November 9, 1891; 10,000 feet. "Irides orange; feet pinkish red; length, 14 inches."

Female, adult, Dras Valley, Kashmir, November 9, 1891; 10,000 feet. "Length, 13 inches."

Male, adult, Dras Valley, Kashmir, March 27, 1892; 9,000 feet. "Bill black; feet red; irides orange red; cere white; length, 13⅜ inches."

Male, adult, Dras, Kashmir, June 21, 1893; 10,000 feet. "Bill black; cere white; feet red, claws black; irides brownish yellow; length, 13 inches."

Female, adult, Haramosh, Baltistan, February 16, 1892; 5,500 feet. "Bill black; cere grayish white; feet red; irides yellowish brown; length, 12⅞ inches."

Male, adult, Haramosh, Baltistan, March 8, 1892; 7,000 feet. "Bill black; cere gray; feet dull pink; irides orange, paler near pupil; length, 13⅜ inches."

The female from Haramosh has the rump gray, similar to the back; the male, on the other hand, has a very pale gray rump, the lower part being almost white. The four Dras birds show considerable grayish white on the rump, the color being in rather marked contrast with the gray of the back.

160. COLUMBA RUPESTRIS (Pallas).

Male, adult, Braldu Valley, Baltistan, December 23, 1891; 10,000 feet. "Bill black; feet dull red; irides orange; length, 13¼ inches."

Male, adult, Namika-la Pass, Kashmir, June 26, 1893; 12,000 feet. "Bill black; cere white; irides red; feet pink, claws black; length, 13¼ inches."

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161. COLUMBA LEUCONOTA, Vigors.

Male, adult, Braldu Valley, Baltistan, December 23, 1891; 10,000 feet. "Bill black; cere dusty gray; feet bright red; irides yellow; length, 13¾ inches."

162. TURTUR FERRAGO (Eversmann).

Female, adult, Vale of Kashmir, August 23, 1891; 6,000 feet. "Bill black at tip, dusky purple at base; feet dark purple; irides orange; length, 12⅜ inches."

Male, adult, Vale of Kashmir, September 1, 1891. "Feet dull purple; irides orange; bill dull purple at base, leaden blue at tip."

Male, immature, central Kashmir, September 12, 1891. "Feet dull purple; base of bill dusky purple, tip dull leaden blue; irides orange; length, 13¼ inches."

Male, adult, Pir Panjal range, Kashmir, August 29, 1891; 9,000 feet. "Length, 12¾ inches."

163. TURTUR DOURACA, Hodgson.

Male, adult, Vale of Kashmir, August 12, 1891. "Feet dark purple; irides red."

Male, adult, Vale of Kashmir, August 12, 1891. "Feet purple; irides red."

Male, adult, Vale of Kashmir, August 24, 1891. "Feet dull purple; bill black."

Male, adult, Vale of Kashmir, August 10, 1891.

164. TURTUR HUMILIS (Temminck).

Male, adult, Vale of Kashmir, June 25, 1891.

Family PHASIANIDÆ.

165. TETRAOGALLUS HIMALAYANUS, Gray.

Female, immature, central Kashmir, September 30, 1891; 11,000 feet. "Naked skin behind eye yellow; front of tarsus and top of toes orange brown, rest of feet dull brown; irides light brown; length, 22½ inches; weight, 3¾ pounds."

166. CACCABIS SAXATILIS CHUCAR (Gray).

Male, adult, central Kashmir, September 21, 1891; 11,000 feet. "Bill vermilion; feet dull red; length, 13¼ inches; weight, 20 ounces."

Female, adult, central Kashmir, October 1, 1893; 11,000 feet. "Bill dark red; feet red; irides pale brown; length, 13½ inches; weight, 14 ounces."

Male, adult, Rondu, Baltistan, February 4, 1892; 6,000 feet. "Bill red; feet red; irides brown; length, 14⅛ inches; weight, 20 ounces."

Male, adult, Haramosh, Baltistan, March 8, 1892; 7,000 feet. "Bill and feet red; irides clear brown; length, 14 inches; weight, 17 ounces."

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Male, adult, Leh, Ladak, July 1, 1893; 11,000 feet. "Bill dark red; irides brown."

The Ladak specimen is somewhat lighter than the rest of the series, but this is due in part to the worn condition of its plumage. I presume this individual represents the form described by Hume and Henderson as *Caccabis pallescens*.

167. LOPHOPHORUS REFULGENS. Temminck

Male, adult, central Kashmir, October 16, 1891; 9,000 feet. "Length, 28½ inches; weight, 6½ pounds; feet greenish brown; bill dark brown, paler below and along gape."

Female, adult, central Kashmir, October 15, 1891; 9,000 feet. "Irides brownish gray; feet greenish; length, 24 inches; weight, 3½ pounds."

Family ARDEIDÆ.

168. ARDETTA MINUTA (Linnæus).

Male, adult, Dal Lake, Vale of Kashmir, May 25, 1893. "Feet and legs pale green; claws horn brown; bill horn black above, greenish yellow beneath; irides brownish yellow; length, 14¾ inches."

Female, adult, Dal Lake, Vale of Kashmir, May 25, 1893. "Feet and legs green; bill brownish horn above, brownish yellow beneath; irides brownish yellow; length, 13¾ inches."

Female, adult, Dal Lake, Vale of Kashmir, May 25, 1893. "Bill horn black above, greenish yellow beneath; feet green; irides brownish yellow; length, 15 inches."

169. NYCTICORAX NYCTICORAX (Linnæus).

Male, adult, Vale of Kashmir, June 3, 1893.

Family ANATIDÆ.

170. ANAS BOSCHAS, Linnæus.

Male, Braldu Valley, Baltistan, December 6, 1891.

171. ANAS CRECCA, Linnæus.

Male, adult, Vale of Kashmir, winter of 1891–'92.

Female, adult, Shigar Valley, Baltistan, November 22, 1891; 8,000 feet. "Length, 14⅜ inches."

172. NYROCA NYROCA (Güldenstadt).

Female, adult, Vale of Kashmir, May 27, 1893. "Bill, feet, and legs leaden; webs black; irides dirty gray; length, 16¼ inches."

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Family LARIDÆ.

173. LARUS RIDIBUNDUS, Linnæus.

Female, adult, Woolar Lake, Kashmir, October 27, 1891; 5,000 feet. "Bill red; feet dull red."

Female, immature, Woolar Lake, Kashmir, October 27, 1891; 5,000 feet. "Feet brownish flesh color."

Female, immature, Woolar Lake, Kashmir, October 27, 1891; 5,000 feet. "Feet brownish yellow."

174. HYDROCHELIDON LEUCOPAREIA (Temminck).

Male, adult, Woolar Lake, Kashmir, August 4, 1891. "Bill and feet dark carmine; length, 10½ inches."

Female, adult, Woolar Lake, Kashmir, August 4, 1891.

Male, immature, Vale of Kashmir, September 4, 1891.

Family JACANIDÆ.

175. HYDROPHASIANUS CHIRURGUS (Scopoli).

Male, adult, Woolar Lake, Vale of Kashmir, June 23, 1891.

Male, adult, Woolar Lake, Vale of Kashmir, June 23, 1891.

Female, adult, Woolar Lake, Vale of Kashmir, June 23, 1891. "Female is much the larger of the sexes."

Male, adult, Woolar Lake, Vale of Kashmir, August 4, 1891.

Female, adult, Woolar Lake, Vale of Kashmir, August 4, 1891. "Bill and feet pale leaden blue; irides dark brown; length, 21¾ inches."

Female, immature, Woolar Lake, Vale of Kashmir, October 27, 1891; 5,000 feet.

Family CHARADRIIDÆ.

176. ÆGIALITIS DUBIA (Scopoli).

Male, immature, Woolar Lake, Kashmir, October 27, 1891; 5,000 feet.

177. ÆGIALITIS DUBIA JERDONI (Legge).

Male, adult, Vale of Kashmir, April 12, 1892; 5,200 feet. "Bill black, yellow at base; feet slaty; irides very dark brown; length, 6½ inches."

The wing of this specimen measures 3.90 inches.

178. VANELLUS VANELLUS (Linnæus).

Male, immature, Woolar Lake, Kashmir, October 27, 1891; 5,000 feet. "Feet brown."

Male, immature, Woolar Lake, Kashmir, October 27, 1891; 5,000 feet.

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179. SARCOGRAMMUS INDICUS (Boddaert).

Male, adult, Vale of Kashmir, September 1, 1891. "Feet yellow; base of bill and cere dark crimson, tip of bill black; irides reddish brown."

Family SCOLOPACIDÆ.

180. CALIDRIS ARENARIA (Linnæus).

Female, adult, Woolar Lake, Kashmir, October 27, 1891; 5,000 feet.

181. TOTANUS OCHROPUS (Linnæus).

Female, adult, Vale of Kashmir, August 13, 1891.

Male, immature, Woolar Lake, Kashmir, October 26, 1891; 5,000 feet.

Male, immature, Woolar Lake, Kashmir, October 26, 1891; 5,000 feet. "Feet greenish slate color."

Male, immature, Woolar Lake, Kashmir, October 28, 1891; 5,000 feet. "Bill greenish at base, becoming black at tip; feet greenish; length, 9¼ inches. Very common."

182. ACTITIS HYPOLEUCOS (Linnæus).

Female, adult, Nowboog Valley, eastern Kashmir, May 30, 1892; 6,500 feet. "Bill brown, black at tip; feet greenish slate; irides dark brown; length, 8⅛ inches."

183. ROSTRATULA BENGHALENSIS (Linnæus).

Female, adult, Vale of Kashmir, May 27, 1893. "Feet and legs leaden, with greenish tinge; bill dull reddish, olivaceous near base; claws brown; length, 9¾ inches. Contained a mature egg."

Family RALLIDÆ.

184. FULICA ATRA, Linnæus.

Female, adult, Woolar Lake, Kashmir, April 11, 1892. "Feet pale leaden, soles dark leaden; irides blood red; bill and frontal plate white: length, 15¾ inches."

185. GALLINULA CHLOROPUS (Linnæus).

Adult, Vale of Kashmir, May, 1892.

Female, adult, Vale of Kashmir, June 3, 1893. "Feet and legs green; bill and frontal plate red, point of bill greenish yellow; irides brown; length, 12½ inches."

186. AMAURORNIS AKOOL (Sykes).

Male, young, Vale of Kashmir, September 5, 1891.

This specimen is very young, just leaving the downy stage, and I have some slight misgivings about the correctness of the identification.

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The back is uniform rich brown (between bistre and vandyke brown); lower throat, lores, and ear coverts gray (between drab and smoke gray); middle of breast pale buff, passing laterally into deep wood brown, this color much deeper on flanks; median line of abdomen white; sides of abdomen and thighs drab gray; throat and chin white, mingled with black down. All of these color patches are sharply defined, and narrowly separated from each other by lines of the black down which had evidently a short time previously covered the bird. Tarsus, 1.52 inches; culmen, 0.89.

187. LIMNOBÆNUS FUSCUS, (Linnæus).

Female, adult, Vale of Kashmir, May 30, 1893. "Bill black above, greenish beneath; legs and feet vermilion, claws horny brown; irides red; orbital skin red; length, 7¼ inches."

Family PODICIPIDÆ.

188. COLYMBUS FLUVIATILIS, Tunstall.

Male, adult, Vale of Kashmir, April 8, 1893. "Bill black, tip white; bare skin at base of bill and gular patch pale green; outsides of feet and soles black; inner sides of tarsi and tip of toes greenish slate; irides brownish green; length, 10 inches."

Female, adult, Vale of Kashmir, June 2, 1893. "Feet greenish slate; bill black; skin at base of lower mandible pale yellowish green; irides yellowish brown."

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OSTEOLOGICAL AND PTERYLOGRAPHICAL CHARACTERS OF THE PROCNIATIDÆ.

By F. A. LUCAS,
Curator of the Department of Comparative Anatomy.

THE striking characters of the skull of *Procnias* are the total absence of the transpalatine processes, the small size of the interpalatines, and the slenderness and outward curvature of the prepalatine bars, which makes the interpalatine vacuity almost oval in shape. I do not recall any other passerine in which the transpalatine process is totally absent, a condition which exists in such distant relatives of the Passeres as *Thinocorus* and *Turnix*. In the skull of a "half-ripe" embryo of a

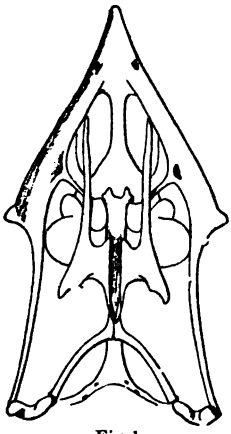

Fig. 1.

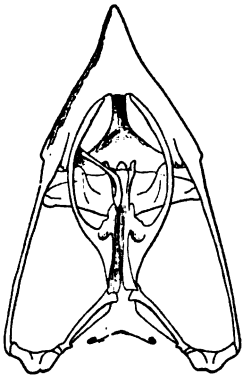

Fig. 2.

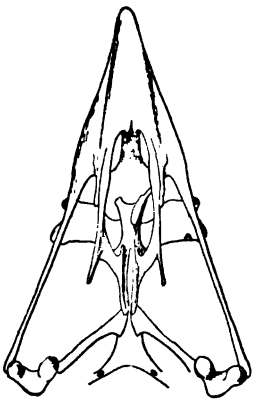

Fig. 3.

PALATAL REGIONS.

(1) Petrochelidon lunifrons; (2) Procnias tersa; (3) Piranga erythromelas.

Slightly enlarged.

swallow,[1] the transpalatine processes are seen to ossify from separate centers, so that the condition found in *Procnias* may be considered as due to lack of development.

The maxillopalatines are long, slender, scarcely expanded at their free ends, and slightly pneumatic. There is a stout palatomaxillary

[1] Parker, "Skull of Ægithognathous Birds," Part II, pl. LII, fig. 4.

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process, whether or not developed from a separate center is not known. The vomer is characteristically passerine, with the edges of the anterior extremity much upturned, instead of flattened, as in swallows and tanagers.[1] In the approximation of the pterygoids to the basitemporal region, there is a suggestion of such forms as *Micropus*, this being noticeable in many so-called picarian birds.

The jaw possesses no salient characters, but in spite of its broad, swallow-like shape, its general characteristics are suggestive of tanagrine rather than of hirundine affinities, and the same is true of the shape of the narial openings, although from the width of the cranium it might be thought that the reverse would be the case. The ventral portion of the ectoethmoid is narrow, as in tanagers, instead of being expanded, as in swallows, and the postpalatines are produced over the pterygoids, which again does not happen in swallows.

The hyoid bones are short, the tongue itself hirundine in pattern, with its posterior portion covered with short, backwardly directed papillæ. The same style of tongue occurs among the swifts, and will probably be found in other insectivorous birds, in which the tongue is capable of but little protrusion. The manus is strictly passerine, as is also the hypotarsus, which has five tendinal perforations, whereof the postero-outermost is closed by cartilage, as in some swallows, although this is a comparatively unimportant particular.

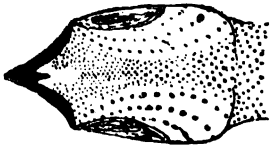

Fig. 4.

HEAD OF PROCNIAS TERSA.

Natural size.

The skull of *Chlorophonia*, although not typically tanagrine, bears no close resemblance to that of *Procnias*, although the two are usually placed near one another.

Résumé.—The skull, in spite of its superficial resemblance to that of a swallow, is structurally more nearly like that of such a typical tanager as *Piranga erythromelas*; but in the characters of the palate, *Procnias* departs so widely, not only from the tanagers, but from the large majority of passerine birds, as to warrant the establishment of a separate family for the members of the genus.

I am indebted to Mr. Hubert L. Clark, who compared the pterylosis of *Procnias* with that of a number of tanagers, for the appended notes. Unfortunately the only specimen of *Procnias* available was a dried skin, and this at first sight appeared to show a dorsal apterium, although close examination showed that, in all probability, this was due to loss of feathers in making up the skin.

"The ninth primary is the longest and the others follow in regular succession, eighth, seventh, sixth, etc., but the eighth is practically equal to the ninth. While this arrangement is by no means rare among the Passeres, it is not the rule, as the ninth is usually shorter than the

[1] Comparison is made with the swallows, because superficially the skull of *Procnias* strongly suggests that of a swallow.

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eighth or seventh. In the specimens of *Rhamphocœlus passerini*, *Tanagra darwini*, and *Tanagra palmarum*, which were examined with *Procnias* for comparison, the arrangement was quite different, *Rhamphocœlus* having the ninth about equal to the first and second, and much shorter than the sixth, which was the longest; the two *Tanagras* had the sixth, seventh and eighth about equal, the ninth shorter and about equal to the fifth.

"In the arrangement of the feathers of the head, *Procnias* differs from most Passeres by having several of the rows on the posterior part of the crown on each side widely separated, thus forming a peculiarly marked longitudinal pattern. This arrangement is, however, probably due to the increased width of the head, which is much the shape of a swallow's; the same arrangement, due to probably the same cause, is carried to the extreme in the *Caprimulgi*.

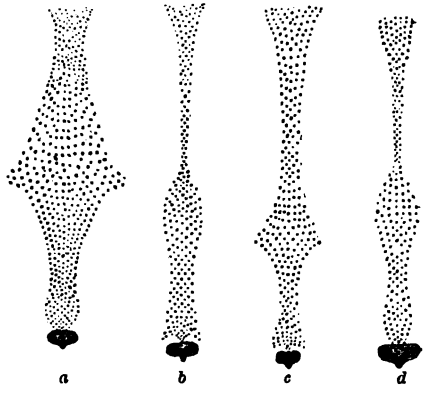

Fig. 5.

DORSAL TRACTS.

(*a*) Procnias tersa; (*b*) Tanagra darwini; (*c*) Tanagra palmarum; (*d*) Rhamphœlus passerini.

Two-thirds natural size.

"The form of the dorsal tract is very different from that of *Rhamphocœlus* or *Tanagra*, all of which are figured to show the variations. It is a little like *T. palmarum*, or *Certhiola* as figured by Lucas,[1] but the diamond-shaped dorsal tract is longer and nearer the middle of the back. The ventral and femoral tracts were destroyed in making the skin, and no proper conception could be formed of the cervical or sternal tracts, as they were twisted and crowded all out of shape.

"There is nothing in the pterylosis of *Chlorophonia* to indicate any relationship to *Procnias*, but on the other hand there is a decided resemblance to *Tanagra palmarum*. In fact, the only difference from that species worth noting is the smaller size of the dorsal tract, the shape being apparently the same.

"The pterylosis of *Procnias* is evidently passerine, but shows no particular leaning toward any group, and seems to differ slightly from the tanagers, with which it has hitherto been classed. As far as pterylosis alone is concerned, it may be placed anywhere among the Passeres, but not too far from the warblers, finches, or swallows."

[1] Proc. U. S. Nat. Mus., XVII, 1894, p. 303.

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ON BIRDS COLLECTED BY DOCTOR W. L. ABBOTT IN THE SEYCHELLES, AMIRANTES, GLORIOSA, ASSUMPTION, ALDABRA, AND ADJACENT ISLANDS, WITH NOTES ON HABITS, ETC., BY THE COLLECTOR.

By ROBERT RIDGWAY,
Curator of the Department of Birds.

THE present paper is based upon two collections made by Dr. W. L. Abbott, of Philadelphia; one, of 59 specimens, on the Seychelles, during March, April, and May, 1890; the other, of 205 specimens, on Aldabra, Assumption, the Amirante group, Ile Glorieuse, and other islands northwest of Madagascar, during the period extending from July, 1892, to January, 1893, inclusive.

The representation of species, including several accidental visitants, is believed by Dr. Abbott to be very nearly complete, as the following extract from a letter received from him, written at Mahé, Seychelles, March 10, 1893, will more fully explain:

"I have now visited nearly all the small islands in this neighborhood, and think the collection of birds which has been sent is nearly complete. . . . I think almost all the sea birds frequenting these seas are contained in this collection and the one sent three years ago. The only land birds of the Seychelles which I failed to obtain were *Gymnoscops insularis*, Tristram, and *Palæornis wardi*, E. Newton, but of the latter I obtained a specimen a few days since. It is on the verge of extinction here, but is said to be still fairly common in the neighboring island of Silhouette.

"No land bird exists (unless introduced) on any of the Amirantes or other islands between the Seychelles and Cosmolèdo and Aldabra. This is probably due to the fact that these islands are extremely small, and consequently any small bird would be sooner or later blown to sea during the occasional (though rare) hurricanes.

"Aldabra proved quite interesting. I remained there three and a half months, and obtained specimens of all resident species. There are fourteen land birds resident, and I picked up six others that were evidently 'passers-by.' Also obtained nests and eggs of most of them.

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Am sending you (in another letter) a full account of their habits, which may prove interesting. Of the fourteen residents at least eleven will prove new to science, I think.[1] The barn owl [undetermined form, possibly new] and the fruit pigeon [*Alectrœnas sganzini*] seem similar to those of Madagascar. The *Tinnunculus* appears different. The 'flightless bird' proves to be a rail, as I anticipated. It is confined to the islands of Aldabra, Assumption, Astove, and Cosmoledo, though, as the last two were not visited, I only know by hearsay.[2] The most conspicuous water bird of Aldabra, which may be identical with that of Madagascar and Africa, is the flamingo.

"After leaving Aldabra I visited, and got wrecked upon, Gloriosa Island, near Madagascar, where I found three of the five land birds to be entirely different from those of Aldabra, and expect they may turn out to be new. Was unable to get to Cosmoledo and Astove, although three attempts were made; feel certain that they contain something interesting."

I.—BIRDS FROM THE SEYCHELLES.

Family LARIDÆ.

1. STERNA BERNSTEINI, Schlegel.

One specimen; Flat Island, August 7.

2. STERNA MINUTA, Linnæus.

One specimen; Mahé, April 2.

3. STERNA ANÆTHETUS, Scopoli.

Two specimens; Mahé, April 1, the other, without locality, August.

4. ANOUS STOLIDUS (Linnæus).

Three specimens; Seche, April 3.

5. GYGIS ALBA (Sparrmann).

Two specimens; Mahé, March 30.

Family STERCORARIIDÆ.

6. MEGALESTRIS ANTARCTICUS (Lesson).

One specimen, without special locality, August 5.

[1] The number of new forms from Aldabra which I have been able to make out is only seven, but several others doubtfully referred to forms already known may prove to be really distinct when actually compared, our collection lacking the necessary material for making satisfactory comparisons.—R. R.

[2] The Aldabra and Assumption birds prove to be different, however, the latter new to science. Both forms are related to, but quite distinct from, the Madagascar species, *Dryolimnas cuvieri* (Pucheran).—R. R.

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Family PROCELLARIIDÆ.

7. PUFFINUS TENEBROSUS, Pelzeln?

Puffinus tenebrosus, PELZELN, Ibis, 1873, 47 (King George's Sound; Vienna Imp. Mus.).

Three specimens; Ile Cousin, May 7.

Specific characters.—Similar to *P. auduboni*, Finsch,[1] but smaller (wing slightly shorter, other measurements, except length of nasal tube, very much less), tail much less graduated, and under tail-coverts more extensively dusky; no trace of whitish spot over anterior angle of eye; lores and ear-coverts almost wholly dusky; outer side of tarsus almost wholly dusky (nearly the lower half quite black), and outer side of middle toe also chiefly dusky; anterior margin of webs dusky.

I refer this bird, which is obviously distinct from *P. auduboni*, though nearly related, to Pelzeln's *P. tenebrosus* with much doubt. The latter, according to the original description, lacks the dusky anterior margin to the webs, and there are certain other discrepancies; but unless it is *P. tenebrosus*, I do not know what to call it.

According to Finsch,[2] *P. obscurus* (Gmelin) "may be distinguished at once by the uniform pure white under tail-coverts," while the present bird has these feathers even more extensively dusky, as well as rather darker in color than in *P. auduboni*. It seems, however, that Mr. Salvin differently interprets or identifies *P. obscurus*, since, in making comparison between different specimens of what he calls that species, he mentions,[3] as exceptional, a specimen from Samoa, in which "the crissum is white in the middle to its extremity, the sides alone being dusky," while in another Samoan bird "the central feathers of the crissum are dusky, tipped with white."

Possibly the present bird may be *P. obscurus*, according to Mr. Salvin's view as to what constitutes that species; but, lacking specimens for comparison, I can not make a satisfactory determination of the question.

Measurements of Puffinus tenebrosus (?) from the Seychelles.*

Catalogue number.	Collection.	Sex and age.	Locality.	Date.	Wing.	Tail.	Graduation of tail.	Culmen.	Nasal tubes.	Depth of bill in front of nostril.	Tarsus.	Middle toe (with claw).
119756	U.S.N.M	Female ad.	Ile Cousin, Seychelles.	May 7, 1890	7.20	3.00	0.48	1.02	0.38	....	1.45	1.52
119757	....do	Female ad.	.....do.....	.....do	7.70	2.95	.48	1.05	.25	0.25	1.41	1.60
119758	....do	Male ad...	.....do.....	.....do	7.50	3.05	.52	1.00	.27	....	1.40	1.58
			Average..	.....	7.47	3.00	.49	1.02	.30	.25	1.42	1.57

*The measurements in this table are in inches.

[1] *Puffinus auduboni*, FINSCH, Proc. Zool. Soc. Lond., 1872, 111, (Atlantic Ocean). *P. obscurus*, Audubon et Auctorum, nec *Procellaria obscura*, Gmelin.

[2] Proc. Zool. Soc. Lond., 1872, p. 111.

[3] Ibis, July, 1888, p. 357.

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*Measurements * of Puffinus auduboni.*

Catalogue number.	Collection.	Sex and age.	Locality.	Date.	Wing.	Tail.	Graduation of tail.	Culmen.	Nasal tubes.	Depth of bill in front of nostril.	Tarsus.	Middle toe.
11949	U.S.N.M.	Male ad ...	Bahamas ...	Apr. 1, 1859	7.90	3.85	1.10	1.20	0.28	0.22	1.45	1.75
11950	....do	Female ad.	.....do.....	.....	7.65	3.50	.75	1.25	.30	.26	1.40	1.70
110651	....do	Male ad ...	Green Key, Bahamas.	Apr. 4, 1884	8.15	3.60	.90	1.18	.30	.30	1.65	1.75
110654	....do	Male ad ...	Washerwoman Key, Bahamas.	May 7, 1884	8.00	3.65	.75	1.22	.30	.28	1.65	1.85
110655	....do	Male ad ...	.....do.....	.....do	8.05	3.60	.80	1.12	.28	.25	1.58	1.85
110656	....do	Male ad ...	.....do.....	.....do	8.00	3.50	.90	1.12	.27	.28	1.60	1.80
110657	....do	Female ad.	.....do.....	.....do	7.92	3.65	.85	1.12	.28	.27	1.60	1.80
110658	....do	Female ad.	Green Key, Bahamas.	Apr. 4, 1884	7.50	3.45	.85	1.20	.27	.27	1.58	1.75
80978	....do	Male ad ...	Saba, West Indies.	.....	7.95	3.40	....	1.18	.30	.27	1.57	1.77
80979	....do	Female ad.	.....do.....	.....	8.25	3.55	.80	1.15	.32	.28	1.65	1.85
114978	....do	Female ad.	Grenada, West Indies.	Apr. 2, 1888	7.82	3.62	.92	1.08	.25	....	1.60	1.90
			Average.		7.93	3.58	0.86	1.17	.29	.27	1.58	1.80

* The measurements in this table are in inches.

Family RALLIDÆ.

8. GALLINULA CHLOROPUS (Linnæus).

Two specimens; La Digue, April 10.

Family ARDEIDÆ.

9. BUBULCUS BUBULCUS (Savigny).

One specimen; Ile Coëtivy, August 10.

10. BUTORIDES ATRICAPILLUS (Afzelius).

Two specimens; Mahé, April 4, and La Digue, April 10.

Family PHAËTONTIDÆ.

11. PHAËTON CANDIDUS (Drapiez).

Three specimens; Mahé, March 29, 30.

Family COLUMBIDÆ.

12. TURTUR PICTURATUS (Temminck) (?).

One specimen; Mahé, July 19.

This specimen, an adult female, differs so decidedly in coloration from an adult male of true *T. picturatus*, from Madagascar, that I very much doubt whether the two birds are identical. The Mahé specimen is

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altogether paler in coloration, the back and lesser wing-coverts being light rusty chocolate, instead of deep violet-bay, and the under parts dull vinaceous-buff, instead of deep vinaceous. There are also other minor differences.[1]

According to Dr. Sclater[2] this bird was "certainly" introduced into the Seychelles; but whether from Madagascar or Mauritius is not stated. The bird found in Mauritius is "believed by Professor Newton to have been originally introduced there from Madagascar,[3] and Dr. Sclater says[4] that a Seychelles skin examined by him did not differ from Mauritius examples. Dr. Abbott, however, is positive that the Seychelles bird is not an introduced species, but a native of the islands.

It remains to be seen whether adult males from the Seychelles differ as much from Madagascar specimens of the same sex as does the female from a Madagascar male. From the nature of the differences observed, noted above, I am inclined to think that there are sufficient differences existing to warrant their separation; and should this surmise prove correct, and there be no mistake concerning the alleged introduction of the Seychelles bird from Mauritius, then the logical conclusion would be that the birds of the last-mentioned island are indigenous, and not introduced from Madagascar, as Professor Newton believed. In view of the above facts, I propose for the Seychelles bird the name *Turtur abbotti*.

13. TURTUR ROSTRATUS, Bonaparte.

Two specimens; Mahé, March 19 and 29.

14. ALECTRŒNAS PULCHERRIMA (Scopoli).

Five specimens; Mahé, March 30 and July 22.

Family FALCONIDÆ.

15. TINNUNCULUS GRACILIS (Lesson).

Two specimens; Mahé, March 28 and April 4.

Family PSITTACIDÆ.

16. CORACOPSIS BARKLYI, E. Newton.

Two specimens; Ile Praslin, May 6.

17. PALÆORNIS WARDI, E. Newton.

One specimen; Mahé, March.

[1] Its measurements are as follows: Wing, 6.40 inches; tail, 4.55; culmen, 0.75; tarsus, 0.68.

[2] Proc. Zool. Soc. Lond., 1871, p. 693.

[3] Sclater, loc. cit.

[4] Loc. cit.

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Family CUCULIDÆ.

18. CUCULUS Sp?.

No specimens sent, but Dr. Abbott writes that a gray cuckoo, rather larger than the one found in Madagascar, occurs on Mahé. He saw a fragmentary specimen in the possession of an English druggist at Port Victoria.

Family MICROPODIDÆ.

19. COLLOCALIA FRANCICA (Gmelin).

Two specimens; Mahé, April 17.

Family "TIMELIIDÆ."

20. IXOCINCLA CRASSIROSTRIS (E. Newton).

Four specimens; Mahé, March 28, 29.

21. COPSYCHUS SECHELLARUM, A. Newton.

Two specimens; Marianne, April 11.

Family MUSCICAPIDÆ.

22. TERPSIPHONE CORVINA (E. Newton).

Six specimens; La Digue, April 9, 10; Marianne, April 11.

Family NECTARINIIDÆ.

23. CINNYRIS DUSSUMIERI (Hartlaub).

Seven specimens; La Digue, April 9; Félicite, April 12; Ile Cousin, May 7; Mahé, March 28.

Family MELIPHAGIDÆ.

24. ZOSTEROPS SEMIFLAVA, E. Newton.

One specimen; Marianne, April 11.

25. ZOSTEROPS MODESTA, E. Newton.

Three specimens; Mahé, March 28.

Family PLOCEIDÆ.

26. NESACANTHUS SECHELLARUM (E. Newton).

Four specimens; Ile Cousin, May 7; Marianne, April 11.

27. FOUDIA MADAGASCARIENSIS (Linnæus).

Two specimens; Mahé, March 28, 31.

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II. BIRDS OF THE AMIRANTE GROUP.

Family LARIDÆ.

1. STERNA BERNSTEINI, Schlegel.

Ile Poivre; no specimens.

2. GYGIS ALBA (Sparrmann).

Iles Alphonse, Des Roches, Poivre, St. Joseph, and D'Arros; no specimens.

3. ANOUS STOLIDUS (Linnæus).

Ile Poivre; no specimens.

Family PROCELLARIIDÆ.

4. PUFFINUS SPHENURUS, Gould.

Two specimens; Ile Poivre, August 29. Creole name *Fouquet*. (Abbott, MS.)

Family DROMADIDÆ.

5. DROMAS ARDEOLA, Paykull.

Ile Poivre; no specimens.

Family ARENARIIDÆ.

6. ARENARIA INTERPRES (Linnæus).

Iles Poivre, St. Joseph, and D'Arros; no specimens.

Family SCOLOPACIDÆ.

7. NUMENIUS ARQUATUS MADAGASCARIENSIS (Linnæus).

One specimen; Ile Poivre, August 27.

8. NUMENIUS PHÆOPUS (Linnæus).

Iles Alphonse, Des Roches, Poivre, St. Joseph, and D'Arros; no specimens.

9. TOTANUS NEBULARIUS (Gunnerus).

One specimen, Ile St. Joseph, August 29.

Family ARDEIDÆ.

10. ARDEA CINEREA, Linnæus.

Iles Alphonse, Poivre, and St. Joseph; no specimens.

11. BUTORIDES ATRICAPILLA (Afzelius).

Ile Alphonse, August 24; one specimen. Also found on Iles Des Roches, Poivre, St. Joseph, and D'Arros, *fide* Abbott, MS.

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12. BUBULCUS BUBULCUS (Savigny).

Iles Alphonse, Des Roches, Poivre, St. Joseph, and D'Arros; no specimens.

Family PELECANIDÆ.

13. PELECANUS RUFESCENS, Gmelin.

One specimen; Ile St. Joseph, August 29.

"A small colony—perhaps one hundred individuals"—said by Dr. Abbott to inhabit Ile St. Joseph, and noteworthy "as being the only colony of pelicans in these seas."

Family SULIDÆ.

14. SULA PISCATOR (Linnæus).

One specimen; Ile St. Joseph, August 29. Also found on Ile D'Arros. (Abbott, MS.)

15. SULA LEUCOGASTRA (Boddaert).

Three specimens; Ile D'Arros, August 30. Also found on Ile Poivre and St. Joseph.

"Creole name, '*Capucin.*' Only a few pairs live in Aldabra. Breeds in considerable number in Gloriosa; also in the Amirantes." (Abbott, MS.)

It seems that Dr. Abbott confounded this species with the gray phase of *S. piscator;* at least the only specimens which he sent of *S. leucogaster* are the three from Isle D'Arros, Amirantes, mentioned above.

Family FREGATIDÆ.

16. FREGATA ARIEL (Gould).

One specimen; Ile St. Joseph, August 29.

The name *ariel*, Gould, having been quite generally cited as a synonym of *minor*, Gmelin, it is proper that I state here my reasons for reinstating it as a specific name:

A reference to Gmelin's diagnosis and the descriptions and figures upon which it is based proves beyond question that the name *minor* belongs to the small intertropical form of *F. aquila.* The bird under consideration is unquestionably a distinct species from *F. aquila*, being readily distinguished from the small form to which the name *minor* belongs by several very positive characters, involving not only differences of coloration, but of form and dimensions also. That the name *F. ariel* (Gould) belongs to this distinct species I have been able to determine positively by the assistance of Mr. Witmer Stone, conservator of the ornithological section of the Philadelphia Academy of Natural Sciences, who, at my request, kindly examined Gould's types in the collection of that institution. The characters of *F. ariel* are as follows:

Specific characters.—Much smaller than *F. aquila minor*, with very

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much shorter and slenderer bill and smaller feet. Adult male with a transverse patch of white on each flank.

Adult male.—No. 128775, U.S.N.M., Ile St. Joseph, Amirante group, Indian Ocean, August 29, 1892; Dr. W. L. Abbott: Plumage black, duller, and inclining to dark grayish brown on tertials and under parts, the lanceolate feathers of the top of the head, hind neck, back, and scapulars, as well as some of the smaller wing-coverts, very slightly glossed with dull greenish and purplish (the former prevailing); outer webs of rectrices faintly glossed with purple. A conspicuous transverse, somewhat crescentic, patch of white on each flank. Shafts of rectrices pale brown or brownish white on under surface. "Bill brownish horn; gular pouch red; feet black; irides brown." (Abbott, MS.)

Total length (before skinning), 30.50 inches; wing, 20; tail, 13; middle feathers, 5.70; culmen, 3.30; greatest width of bill at base, 0.92; depth at base, 0.95; depth through narrowest part, 0.42; middle toe, 1.80.

Family PERDICIDÆ.

17. "PARTRIDGE."

Introduced from Madagascar, via Mauritius, into Iles des Roches, Poivre, and D'Arros. (Abbott, MS.)

Family COLUMBIDÆ.

18. TURTUR SATURATUS, Ridgway.

Turtur saturatus, RIDGWAY, Proc. U. S. Nat. Mus., XVI, No. 953, Advance sheet, August 16, 1893, p. 4.

Specific characters.—Similar to *T. aldabranus*, Sclater, but much darker; the whole back rich purplish chocolate, the head, neck, and chest similar, but slightly paler; light-colored tips to rectrices more restricted and more tinged with gray (wholly gray in adult female); adult male with sides of neck distinctly glossed with green.

Habitat.—Amirante group (Ile Poivre; Ile Alphonse?).

Type.—No. 128725, U.S.N.M., male adult, Ile Poivre, August 22, 1892; Dr. W. L. Abbott. "Bill whitish horn at tip, cere and base livid purple; feet livid purple in front, leaden behind." (Abbott, MS.)

Not having any adult male from Ile Alphonse, I am somewhat doubtful regarding the question of whether the birds of that island and Ile Poivre are identical. An adult female from Ile Alphonse is in general characters similar to the male from Ile Poivre, but has the wings, rump, upper tail-coverts, and middle tail feathers much browner (very nearly Prout's brown on upper tail-coverts), while the terminal-spaces of the tail feathers are wholly gray or else tinged with brown, there being no white whatever. There is only a trace of green gloss on the sides of the neck, and this is observable only in certain lights. The dimensions are considerably smaller than in the Ile Poivre bird,

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but not being greater than between males and females of *T. aldabranus*, the difference is undoubtedly merely sexual.

A young female from Ile Alphonse is similar to the adult but still browner, the upper tail-coverts, etc., approaching chestnut, the wing-coverts and some of the remiges tipped with chestnut, and the terminal tail spaces largely rusty brown.

Family "TIMELIIDÆ."

19. IXOCINCLA CRASSIROSTRIS (E. Newton).

One specimen; Ile Poivre, August 27.

20. COPSYCHUS SECHELLARUM (E. Newton).

One specimen; Ile Alphonse, August 24. (Introduced, *fide* Abbott, MS.)

Family PLOCEIDÆ.

21. FOUDIA MADAGASCARIENSIS (Linnæus).

Two specimens; Ile des Roches, August 26. (Introduced, *fide* Abbott, MS.)

22. ESTRELDA ASTRILD (Linnæus).

Two specimens; Ile Alphonse, August 24. (Introduced, *fide* Abbott, MS.)

Family FRINGILLIDÆ.

23. PASSER INDICUS, Jardine and Selby.

Iles des Roches, Poivre, St. Joseph, and D'Arros; no specimens. (Introduced, *fide* Abbott, MS.)

24. SERINUS ICTERUS (Bonnaterre).

One specimen; Ile des Roches, August 26. (Introduced, *fide* Abbott, MS.)

III.—BIRDS FROM FLAT ISLAND.

Family LARIDÆ.

1. STERNA MINUTA (Linnæus).

Creole name, "*Fanchon*." (Abbott, MS.)

2. GYGIS ALBA (Sparrmann).

Family SCOLOPACIDÆ.

3. NUMENIUS PHÆOPUS (Linnæus).

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Family ARDEIDÆ.

4. BUTORIDES ATRICAPILLUS (Afzelius).

No specimens of any of these species were received from Flat Island.

V.—BIRDS FROM COËTIVY.

Family LARIDÆ.

1. GYGIS ALBA (Sparrmann).

Family SCOLOPACIDÆ.

2. NUMENIUS PHÆOPUS (Linnæus).

Family ARDEIDÆ.

3. BUTORIDES ATRICAPILLUS (Afzelius).

4. BUBULCUS BUBULCUS (Savigny).

Family FREGATIDÆ.

5. FREGATA ARIEL, Gould?

(Possibly *F. aquila minor*, since Dr. Abbott did not distinguish the two species.)

Family PHASIANIDÆ.

6. "PARTRIDGE."

(Introduced, *fide* Abbott, MS.)

None of the species found on Coëtivy were collected by Dr. Abbott.

VI.—BIRDS FROM PROVIDENCE ISLAND.

Family LARIDÆ.

1. STERNA BERNSTEINI, Schlegel.

Two specimens, August 17.

2. STERNA MELANAUCHEN, Temminck.

Three specimens, August 17.

3. ANOUS STOLIDUS (Linnæus).

One specimen, August 14.

4. GYGIS ALBA (Sparrmann).

No specimens.

Family DROMADIDÆ.

5. DROMAS ARDEOLA, Paykull.

Three specimens, August 18.

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Family ARENARIIDÆ.

6. ARENARIA INTERPRES (Linnæus).

One specimen, August 14.

Family CHARADRIIDÆ.

7. ÆGIALITIS GEOFFROYI, Wagler.

No specimens.

VII.—BIRDS FROM ASSUMPTION ISLAND.

Family LARIDÆ.

1. GYGIS ALBA (Sparrmann).

No specimens and no notes.

Family SCOLOPACIDÆ.

2. NUMENIUS PHÆOPUS (Linnæus).

No specimens.

Family RALLIDÆ.

3. DRYOLIMNAS ABBOTTI, Ridgway.

Rougetius abbotti, Ridgway, The Auk, XI, January, 1894, 74 (Assumption Island; U.S.N.M.).

Specific characters.—Similar to *D. curieri* (Pucheran), but upper parts very much lighter and grayer, black streaks on back narrower, and size less, the wing especially. Differs from *D. aldabranus* (Günther) in the streaked back and scapulars.

Type.—No. 128826, U.S.N.M.; Assumption Island, September 18, 1892; Dr. W. L. Abbott. Four specimens, September 18.

Family SULIDÆ.

4. SULA PISCATOR (Linnæus).

No specimens.

5. SULA CYANOPS, Sundevall.

One specimen, September 18. "Creole name, '*Fou general.*' A few breed in Assumption, laying a single egg on bare ground on sand dunes. Common in Gloriosa Island and Ile Lise, and also found in several of the Amirantes." (Abbott, MS.)

6. SULA ABBOTTI, Ridgway.

Sula abbotti, RIDGWAY, Proc. U. S. Nat. Mus., XVI, 1890, p. 599 (Assumption Island; U.S.N.M.).

Specific characters.—Most like *S. cyanops*, Sundevall, but bill much more robust, and coloration different, the prevailing color of the wings

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and tail deep black instead of grayish brown, the wing feathers (both remiges and coverts) with inner webs and bases largely and abruptly pure white, and the upper tail-coverts and flanks marked with guttate or wedge-shaped spots of black.

Type.—No. 128761, U.S.N.M., adult male, Assumption Island, Indian Ocean, September 18, 1892; Dr. W. L. Abbott: Head, neck, back, rump, upper tail-coverts, and entire under parts pure white; scapulars and wing-coverts pure white basally, grayish black terminally, the former mostly concealed, but frequently exposed as angular spots or streaks, particularly on the lesser and middle wing-coverts; greater coverts with inner webs pure white, except at tip; remiges and primary coverts black superficially, but inner webs of secondaries chiefly (those of innermost feathers wholly) pure white, and those of the primaries also largely pure white, this color reaching to the shaft on the basal portion of the first quill, which also has the outer web white, and the shaft yellowish white, at base; on the innermost primary the white forms a broad edging which extends nearly to the tip, gradually running out to the edge, but at the base occupying the entire width of the web. Tail deep black, the feathers (except middle pair) sharply tipped with pure white, and broadly edged with the same at the base. Each of the upper tail-coverts has a large wedge-shaped median spot of black, and many of the feathers of the flanks are similarly marked. "Iris dark brown; feet leaden gray, lower parts of webs black; tip of bill [for about 1 inch] black; [rest of] bill fleshy white; orbital skin black; gular pouch light green." (Abbott, MS.)

Total length (skin), about 28 inches; wing, 18; tail, 8.40, outer feathers 3.20 shorter; culmen, 4.40; depth of bill at base (in front of lores), 1.65, width at same point, 1.22; tarsus, 2; middle toe, 3.50.

This fine species is a little larger than *S. cyanops*, and of similar general appearance, but differs very much both in form and coloration. The bill is much heavier than in that species, for while but little longer it is altogether deeper and broader through the base. The serrations of the tomia are also much coarser. The tarsus is decidedly shorter, but the toes much longer, than in *S. cyanops*, and the covering of both legs and feet is far rougher than in that or any other species of the genus. As to coloration, the most conspicuous features are the sharply defined wedged-shaped black markings on a pure white ground, on the upper tail-coverts and flanks, the extensively white inner webs of the remiges, and the positively black, instead of brown, general color of wings and tail. Wherever the white and the black come into juxtaposition there is always a bold line of junction, and in no case a gradual shading together of the two colors.

"Creole name, '*Fou bœuf*.' A few breed on Assumption. Said not to be found on any other island in these seas." (Abbott, MS.)

Judging from the description in Taczanowski's *Ornithologie du Pérou*,[1]

[1] Vol. III, p. 433.

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S. variegata, Tschudi, of the coast of Peru, somewhat resembles this species in coloration, having, like it, the flanks (also the back) spotted with black, and the inner webs of the remiges and rectrices white basally; but *S. variegata* is a bird of very different proportions, having a very slender bill (like that of *S. nebouxi*) and proportionally more graduated tail, with much narrower and more pointed feathers, besides being considerably smaller in all its dimensions.

Just what differences of coloration exist between adults of the two species I am not able to state, since the single specimen of *S. variegata* which I have been able to examine is an immature bird.

Comparative measurements of Sula abbotti, S. cyanops, S. nebouxi, and S. variegata.

Species.	Number of specimens measured.	Wing.	Tail.	Culmen.	Tarsus.	Middle toe.	Width of bill at base.	Depth of bill at base.
		Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
S. abbotti...	One.....	18.00	8.40 3.20 [1]	4.40	2.00	3.50	1.22	1.65
S. cyanops..	Eight (average).....	16.92	7.00 3.25	3.96	2.19	3.01	1.07	1.45
S. nebouxi..	Seven (average).....	16.73	8.96 4.39	4.20	2.07	2.87	.94	1.25
S. variegata.	One (immature, but full grown).	14.50	6.45 2.75	3.58	1.90	2.40	.82	1.15

[1] The second measurement indicates the difference in length between the longest and shortest rectrices.

Family FREGATIDÆ.

7. FREGATA AQUILA MINOR (Gmelin).

No specimens.

Family PHAËTONTIDÆ.

8. PHAËTON RUBRICAUDUS, Boddaert.

One specimen, September 18.

"Breeds on Assumption and Gloriosa. Nests on the ground in dense thickets or under a bush." (Abbott, MS.)

Family COLUMBIDÆ.

9. TURTUR ALDABRANUS, Sclater?

No specimens.

Family CUCULIDÆ.

10. CENTROPUS INSULARIS, Ridgway.

Centropus insularis, RIDGWAY, Proc. U. S. Nat. Mus., XVII, 1894, p. 373 (Assumption Island; U.S.N.M).

Specific characters.—Quite identical in nuptial plumage with *C. toulou* (Müller); in other plumages, however, very much paler, the posterior under parts barred with pale brownish buff and dusky, in nearly equal quantity (uniform greenish dusky in corresponding plumage of *C. toulou*).

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Habitat.—Aldabra and Assumption islands. (Type, No. 128715, U.S.N.M., female, adult, Aldabra, October, 1892. "Upper mandible horny brown; lower pale horny; irides red; feet bluish black." (Abbott, MS.)

Measurements vary so, both in this form and in *C. toulou*, that I have been unable to derive any satisfactory character from them. The present bird appears, however, to have almost invariably smaller feet than *C. toulou*, as the following measurements show:

Measurements of Centropus toulou.

Museum number.	Sex and age.	Locality.	Date.	Wing.	Tail.	Culmen.	Depth of bill.	Tarsus.	Outer toe.
				Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
A. N.[1]	Male ad	Madagascar.	1873	6.55	9.60	1.32	0.63	1.65	1.20
118599[2]	Female ad	do		5.85	9.50	1.28	.65	1.65	1.15
A. N.[1]	Female ad	do		6.45	8.70	1.30	.60	1.67	1.17
A. N.[1]		do	1879	5.85	9.20	1.17	.52	1.50	.98

[1] Cabinet of Alfred Newton. [2] U. S. N. M.

Measurements of Centropus insularis.

U. S. N. M.	Sex and age.	Locality.	Date.	Wing.	Tail.	Culmen.	Depth of bill.	Tarsus.	Outer toe.
				Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
128717	Male ad	Aldabra	Nov. 18	5.95	9.35	1.10	0.50	1.32	1.00
128714	Female ad	do	Sept. 25	6.70	10.25	1.30	.60	1.50	1.13
128716	Male ad	do	Oct. 4	6.00	9.75	1.12	.55	1.43	1.05
128715	Female ad	do	Oct. 3	6.60	10.80	1.20	.60	1.50	1.12
128712	Male ad	Assumption.	Sept. 18	5.85	8.70	1.10	.55	1.45	1.03

Family NECTARINIIDÆ.

11. CINNYRIS ABBOTTI, Ridgway.

Cinnyris abbotti, Ridgway, Proc. U. S. Nat. Mus., XVII, 1894, p. 372 (Assumption Island; U.S.N.M.).

Specific characters.—Similar to *C. aldabrensis*, but with under parts posterior to maroon-bay pectoral band almost entirely sooty black, with flanks more or less extensively light yellowish gray; upper tail-coverts glossy violet-black, tipped with metallic greenish blue. Female similar to that of *C. aldabrensis*.

Habitat.—Assumption Island. (Type, No. 128680, U.S.N.M., male adult, Assumption Island, September 18, 1892; Dr. W. L. Abbott.)

Measurements of type.—Length (skin), 3 inches; wing, 2.22; tail, 1.62; exposed culmen, 0.70; tarsus, 0.67; middle toe, 0.40.

Four specimens, September 18.

Family CORVIDÆ.

12. CORVUS SCAPULATUS, Daudin.

One specimen, September 18.

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VIII.—BIRDS FROM GLORIOSA ISLAND.

Family LARIDÆ.

1. STERNA BERNSTEINI, Schlegel.

One specimen, January 29.

2. STERNA MEDIA, Horsfield.

One specimen, January 25.

3. STERNA FULIGINOSA, Gmelin.

Three specimens, January 23–February 1.

4. STERNA MELANAUCHEN, Temminck.

No specimens.

Family DROMADIDÆ.

5. DROMAS ARDEOLA, Paykull.

No specimens.

Family ARENARIIDÆ.

6. ARENARIA INTERPRES (Linnæus).

No specimens.

Family SCOLOPACIDÆ.

7. TOTANUS NEBULARIUS (Gunnerus).

No specimens.

8. NUMENIUS PHÆOPUS (Linnæus).

No specimens.

Family ARDEIDÆ.

9. ARDEA CINEREA, Linnæus.

No specimens.

Family SULIDÆ.

10. SULA CYANOPS, Sundevall.

One specimen, February 1. "Breeds in considerable numbers on the neighboring Ile de Lise." (Abbott, MS.)

11. SULA PISCATOR (Linnæus).

Three specimens, January 18–26.

Only the gray, white-tailed plumage of this species seems to have been seen on Gloriosa. "Very common upon Gloriosa, nesting upon 'Fouche' trees, 15 to 20 feet from the ground. At the time of my visit they were building their nests and some had already laid eggs. They were by far the commonest species of booby on the island." (Abbott, MS.)

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Family FREGATIDÆ.

12. FREGATA AQUILA MINOR (Gmelin)?

Since no specimens were collected and as Dr. Abbott did not distinguish between the two species, it is uncertain whether the Frigate birds observed at Gloriosa were this form or *F. ariel*, Gould. (See under Amirantes, page 516.)

Family PHAËTONTIDÆ.

13. PHAËTON RUBRICAUDUS, Boddaert.

One specimen, January 23.

Family PHASIANIDÆ.

14. GALLUS FERRUGINEUS, Gmelin, variety.

No specimens.

"The common fowl has become wild and is plentiful in the jungle upon Gloriosa. They are quite shy and by no means easy to shoot. The crowing of the cocks, continually heard in all directions, gives evidence of their numbers. They show little tendency toward reversion to the original jungle-fowl type, varying much in color, though probably the 'red dunghill' cock and brown hen with yellow legs predominate. The length of the spurs of some of the cocks is remarkable." (Abbott, MS.)

Family COLUMBIDÆ.

15. TURTUR COPPERINGI, Sharpe.

One specimen, January 25.

Family BUTEONIDÆ.

16. MILVUS ÆGYPTIUS (Gmelin).

No specimens.

Family CORACIIDÆ.

17. EURYSTOMUS GLAUCURUS (Müller).

No specimens.

Family "TIMELIIDÆ."

18. IXOCINCLA MADAGASCARIENSIS ROSTRATA, Ridgway?

Three specimens, January 18–26.

"Not common. Has an entirely different note to that of its near relative of Aldabra. All the specimens obtained were in extremely worn plumage."[1] (Abbott, MS.)

[1] Owing to their bad condition of plumage, I have not been able to make out satisfactorily whether the Gloriosa and Aldabra birds of this species are really different or not.—R. R.

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Family HIRUNDINIDÆ.

19. CLIVICOLA RIPARIA (Linnæus).

One specimen, January 29. "Not common." (Abbott, MS.)

Family NECTARINIIDÆ.

20. CINNYRIS SOUIMANGA (Gmelin)?

Four specimens, January 18–29. "Common in Gloriosa. A very few were nesting at the time of our visit." (Abbott, MS.)

Family MELIPHAGIDÆ.

21. ZOSTEROPS MADAGASCARIENSIS GLORIOSÆ, Ridgway.

Zosterops madagascariensis gloriosæ, RIDGWAY, Proc. U. S. Nat. Mus., XVII, 1894, p. 372, (Gloriosa Island), U.S.N.M.

Subspecific characters.—Very similar to true *Z. madagascariensis* (Gmelin), but larger (?), upper parts less vivid olive-green, and under tail-coverts brighter yellow.

Habitat.—Gloriosa Island. (Type, No. 128706, U.S.N.M., female adult, Gloriosa Island, January 25, 1893; Dr. W. L. Abbott.)

Measurements of type.—Length (before skinning), 4.50 inches; wing, 2.17; tail, 1.42; exposed culmen, 0.40; tarsus, 0.65; middle toe, 0.38. "Bill black; base of lower mandible leaden; irides pale brown; feet leaden." (Abbott, MS.)

Having only one specimen of true *Z. madagascariensis* for comparison, I am not quite satisfied of the propriety of separating the Gloriosa bird, which I do more in deference to Professor Newton's views than to my own convictions.

Four specimens, January 18–25. "Is the commonest land bird upon Gloriosa." (Abbott, MS.)

Family CORVIDÆ.

22. CORVUS SCAPULATUS, Daudin.

No specimens.

IX.—BIRDS FROM ALDABRA ISLAND.

Family LARIDÆ.

1. STERNA BERNSTEINI, Schlegel.

No specimens. "Common." (Abbott, MS.)

2. STERNA FULIGINOSA, Gmelin.

No specimens. "'Wide-awake;' rare in Aldabra, but vast numbers breed on Ile Lise, close to Gloriosa Island." (Abbott, MS.)

3. STERNA MELANAUCHEN, Temminck.

One specimen, November 29. "Common." (Abbott, MS.)

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4. ANOUS STOLIDUS (Linnæus).

One specimen, October 15. "Creole name, 'Maqua;' common, breeding in thousands on small islets in the lagoon." (Abbott, MS.)

5. GYGIS ALBA (Sparrmann).

Two specimens, October 9. "Creole name, 'Gaulin'; common." (Abbott, MS.)

Family DROMADIDÆ.

6. DROMAS ARDEOLA, Paykull.

Two specimens, October 8 and November 5. "Creole name, 'Cavalier.' In large flocks along the shore and in the lagoon. Also found on Gloriosa Island, the Seychelles, and Providence Bank." (Abbott, MS.)

Family CHARADRIIDÆ.

7. ÆGIALITIS GEOFFROYI (Wagler).

Three specimens, October 6–November 8. "Rather common." (Abbott, MS.)

Family ARENARIIDÆ.

8. ARENARIA INTERPRES (Linnæus).

Four specimens, October 5–November 10. "Creole name *Alouette.* Very common in all the islands visited." (Abbott, MS.)

Family SCOLOPACIDÆ.

9. ACTITIS HYPOLEUCOS (Linnæus).

One specimen, October 6. "Creole name '*Baise roche.*' Not common in Aldabra." (Abbott, MS.)

10. TRINGA FERRUGINEA, Brünnich.

Two specimens, November 6. "A small flock met with in the lagoon." (Abbott, MS.)

11. TOTANUS GLAREOLA (Linnæus).

One specimen, December 17. "A rather scarce species." (Abbott, MS.)

12. TOTANUS NEBULARIUS (Gunnerus).

One specimen, November 6.

13. CALIDRIS ARENARIA (Linnæus).

Four specimens, October 3–November 10. "Common." (Abbott, MS.)

14. NUMENIUS ARQUATA MADAGASCARIENSIS (Linnæus).

No specimens. "Not common." (Abbott, MS.)

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15. NUMENIUS PHÆOPUS (Linnæus).

Three specimens, September 22–October 6. "Common, also at Gloriosa Island." (Abbott, MS.)

Family RALLIDÆ.

16. DRYOLIMNAS ALDABRANUS (Günther).

[*Rougetius aldabranus*, RIDGWAY, Proc. U. S. Nat. Mus., XVI, 1893, p. 598 (Aldabra Island; U.S.N.M.).]

Specific characters.—Similar to *D. abbotti*, of Assumption, but without trace of dusky streaks on dorsal region, and with white bars on belly and flanks much less distinct (sometimes almost wanting).

No. 128835, U.S.N.M., Aldabra Island, October 10, 1892; Dr. W. L. Abbott. Length (before skinning), 12.50 inches; "irides chestnut brown; feet blackish brown; bill black; base pink."

Eight adults from Aldabra compared with four from Assumption Island agree in the above-mentioned characters. In the specimen (No. 128835) there is scarcely a trace of white bars on the abdomen, while those on the flanks and thighs are nearly obsolete. Other specimens, however, have these markings well developed, though never so broad and distinct as in *D. abbotti*, while in none of them is there even a trace of the blackish streaks on the back, which are very conspicuous in all the birds from Assumption.

"Very common on all the islets of the Aldabra group, abounding on even the smallest, which do not contain more than half an acre, excepting Grand Terre, where it has been exterminated by the cats, which run wild there. Excessively tame and unsuspicious as well as inquisitive, they run up to inspect any stranger who invades their habitat, occasionally even picking at his toes. Each pair seem to reserve a certain area of jungle for their own use and chase off all intruders of their own kind. They are very noisy, particularly in the mornings and evenings. The most common note is a clear short cry, or rather whistle, repeated twelve or fifteen times. While whistling the bird stands erect with his neck full length and bill elevated, seemingly greatly enjoying his own musical performance. Often a pair joins in a duet, the male and female standing close together facing each other. Another note is a sort of squeak and appears to be a sign of anger. They also make a series of short grunts, which seems to be a love note and is also used in calling up their young. These birds fight among themselves quite fiercely, flying at each other like game cocks. One frequently gets the other on his back, pinning him down and pecking at him. The battle is quickly decided and the vanquished gets up and runs away pursued by the conqueror, who, however, soon halts and drawing himself up to his full height whistles a pæan of victory. They do not seem to inflict much injury upon each other in these combats. Their food is anything organic that they can pick up; they never scratch like fowls, but poke around among the dry leaves with their bills. The few people who lived

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upon Aldabra told me that the rails were very destructive in the gardens and also ate the fowls' eggs, but so far as I myself observed they do no damage whatever. They are extremely quick in their movements, darting and dodging about the jungle with great activity. They are not absolutely flightless, but use their wings to assist them in leaping, being able to jump and flutter from 2 to 5 feet off the ground. In the open they can easily be caught by a man, but once in the jungle no terrier can catch them.

"On my first arrival in Aldabra, in September, a few pairs were breeding, but the majority did not breed until November and December, when a heavy rainfall occurred. Sometimes the nest is placed in a shallow cavity in the coral rock, being simply a few dry leaves and sticks; sometimes it is a large loose mass as big as a half bushel basket, a foot or two from the ground and placed in a dense tangle of grass and euphorbia. In this case the cavity is very deep, only the head being visible as the bird sits upon her eggs. The number of eggs laid, as a rule, is three; one nest contained four; some were said to sometimes contain more, but I did not meet with any. I was unable to ascertain the period of incubation or to obtain any very young specimens. The hen sits very closely and can scarcely be driven off her eggs, returning immediately on the departure of the intruder.

"I am told that rails swarm upon the Cosmoledo Atoll and on Astove, about sixty miles eastward from Aldabra. I fear that they are doomed to early extinction on Aldabra from the wild cats which will eventually reach the other islands of the group or be introduced from Grand Terre." (Abbott, MS.)

Family PHŒNICOPTERIDÆ.

17. PHŒNICOPTERUS ERYTHRÆUS, J. Verreaux (?)

Five specimens, October 21–28.

These specimens are very doubtfully referred to *P. erythræus*, since in several respects they do not agree with any description of that form which I have been able to consult. For example, the plumage of the head, neck, and greater part of the body is white, or pinkish white, and not rose color or rose-red, as given in descriptions of *P. erythræus*. They certainly are not *P. antiquorum*, with good specimens of which I have been able to compare the Aldabra birds; and they agree even less with descriptions of *P. minor* than with those of *P. erythræus*.

"Creole name, '*Flammant*.' Resident and doubtless breed. Inhabit the south and east sides of the lagoon of Aldabra in flocks of twenty to sixty individuals. There are altogether probably from five hundred to a thousand in the island. They are found in no other island of these seas except Madagascar. The lagoon is bordered by mangrove swamps and wide stretches of mud flats bare at low tide, affording the flamingoes a capital place of residence. They seem to be rarely seen in any other part of the island." (Abbott, MS.)

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Family IBIDIDÆ.

18. IBIS ABBOTTI, Ridgway.

Ibis abbotti, RIDGWAY, Proc. U. S. Nat. Mus., XVI, 1893, p. 599 (Aldabra Island; U.S.N.M.).

Specific characters.—Similar to *I. bernieri*, as distinguished from *I. æthiopica*, but lower neck naked and minutely papillose; remiges without dark-colored tips (blackish gray in *I. bernieri*, dark metallic green in *I. æthiopica*); decomposed tertials greenish blue on outer, grayish green on inner, webs, and iris light blue instead of white.

Type.—No. 128812, U.S.N.M., female adult, Aldabra Island, October 8, 1892; Dr. W. L. Abbott.

This bird is separated from *I. bernieri* (Bonaparte) with some doubt, but there can be no question as to its distinctness from *I. æthiopica*, Latham. It agrees with *I. bernieri*, and differs from *I. æthiopica* in the slender bill, light-colored iris, and lack of purple hue to the decomposed tertials; but it differs from *I. bernieri*, as described, in having the lower half of the neck (except extreme lower portion) entirely naked and minutely papillose; the iris light blue instead of white; *the remiges without dark-colored tips* (dark metallic green in *I. æthiopica*, blackish gray in *I. bernieri*), and the decomposed tertials greenish blue on the outer, and grayish green on the inner, webs.

In view of the probability that it may prove to be a local insular form, I have proposed for it the name *Ibis abbotti*.

The fresh colors of the unfeathered parts, as recorded on the label, are as follows: "Bill black; feet black; tarsi with a reddish tinge; iris light blue; bare skin on under side of wings dull red." Length (before skinning), 27 inches.

"Creole name, '*Corbijeau blanc*.' Common and extremely tame. A half dozen birds lived constantly about the camp, feeding upon scraps and turtle offal." (Abbott, MS.)

Family ARDEIDÆ.

19. ARDEA CINEREA, Linnæus.

One specimen, October 15.

"Creole name '*Florentin*.' Common, and breeds upon islets in the lagoon. Saw nests with young birds in them in November. It is also found in Providence Island and the Amirantes. Stragglers are said to visit the Seychelles occasionally." (Abbott, MS.)

20. DEMIGRETTA GULARIS (Bosc.)

Two specimens in dark-colored plumage, October 15 and November 10; two in white plumage, October 11 and December 20.

"This is the commonest heron in Aldabra. Two forms exist, but I do not know their relationships. It is probably a case of dimorphism

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(*dichromatism*). The white form is twice or thrice as numerous as the blue; many of the blue ones have white heads or white heads and necks. The Creoles say that the blue ones are the females, and the blue ones obtained were all females, but I have shot white females. Most commonly a white and a blue bird were paired, sometimes both were white, but in no case were two blue ones mated. They were breeding in large numbers in December, building their loose platforms of sticks among the mangroves, and laying from two to four eggs.

"At low tide this and other species of herons, with curlews and sandpipers, feed upon the fringing reef in thousands; then as the tide rises the whole crowd fly over into the lagoon, where the tide is one or two hours later, and continue feeding there until the water becomes too deep." (Abbott, MS.)

21. BUTORIDES ATRICAPILLUS (Afzelius).

One specimen, October 19.

"Creole name, '*La gasse*' or '*Maneek.*' Quite common; breeding among the mangroves in November and December, laying two eggs. Both this and the egrets are very tame and come around the camp and turtle slaughtering place to pick up scraps. They are extremely fond of bluebottle flies, which swarm upon the backs and heads of the turtles when on shore. They stand by hours upon the turtle's back, darting out their beaks with unerring aim upon the blood-sucking flies." (Abbott, MS.)

22. BUBULCUS BUBULCUS (Savigny).

"Apparently the 'buffalo bird' of Africa. Only one noticed in Aldabra. It lived most of the time in the pens with the goats and pigs. Very plentiful in Coëtivy and the Amirantes. Creole name, *Madame Patou.*" (Abbott, MS.)

Family SULIDÆ.

23. SULA PISCATOR (Linnæus).

One specimen, October 20.

"Creole name, '*Fou bête.*' Very abundant, probably from fifty to one hundred thousand individuals of this species make their homes in Aldabra. It is common also in Gloriosa and the Amirantes. Formerly it was found upon every island of these seas, but is now exterminated upon many of them.

"At the time of my visit to Gloriosa Island, in the latter part of January, they were building their nests and some already had eggs. The nest is built in 'Fouche' trees at the height of from 15 to 20 feet from the ground. They were by far the commonest booby upon the island. Upon the neighboring Ile de Lise '*Generaux*' or *Sula cyanops* bred in considerable numbers.

"The boobies lead a hard life of it from the persecution of the frigate birds. These circle around in thousands during the day, awaiting

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the arrival of the flocks of boobies at evening, heavily laden with fish. The old boobies and the 'Capucins' generally escape, but the young birds, still in the gray dress, are the especial objects of pursuit by the frigates, who nearly always succeed in getting their fish from them. The air is filled with the screams and cries of the pursuers and pursued." (Abbott, MS.)

The brown phase of this species, known to the Creoles as the *Capucin*, was, according to Dr. Abbott's notes, represented by a few pairs on Aldabra, but on Gloriosa Island bred in considerable numbers.

Family FREGATIDÆ.

24. FREGATA AQUILA MINOR (Gmelin.)

Three specimens, October 11–13.

"Very common. Breeding in colonies of many thousands in the mangroves. Also abundant in Gloriosa. Found eggs to be plentiful in November. Some of the birds seen appear to be the greater frigate, but there seems to be all gradations of size between the two forms. On February 10, 1893, when off the Amirantes, I observed several frigates and boobies catching flying fish, which were flying about in great numbers, pursued by shoals of bonito. The boobies were by far the most expert, rarely missing a fish, while the latter generally succeeded in escaping from the frigates, either by outflying them or else by dropping back into the water just as the frigate came up with them." (Abbott, MS.)

Family PHAËTONTIDÆ.

25. PHAËTON CANDIDUS, Drapiez.

One specimen, October 24.

"Creole name, '*Paille en queue.*' Breeds in holes in the coral rock in November. Lays one egg, placed on the bare ground." (Abbott, MS.)

Family COLUMBIDÆ.

26. TURTUR ALDABRANUS, Sclater.

Six specimens, September 30–November 18.

"Very common, especially on Ile Picard, and extremely tame. Coming by hundreds around the house, even coming in doors and eating out of one's hand. Builds among the mangroves, where several nests were found." (Abbott, MS.)

27. ALECTRŒNAS SGANZINI (Verreaux).

Six specimens, October 3–December 8.

"This species, similar or identical with that of Madagascar, does not appear to be very common. Its presence or absence is regulated by the supply of food, being especially attracted by the hard fleshy fruit

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of the 'Touche' bush. They are extremely tame and stupid and can almost be caught in the hand. They will sit quiet on a branch for hours and are easily snared with a noose. This habit accounts for the extermination of their near relative in Mauritius. Generally excessively fat. Their voice is a very hoarse and deep *coo*." (Abbott, MS.)

Family BUTEONIDÆ.

28. MILVUS ÆGYPTIUS (Gmelin).

Two specimens, October 2 and December 19. "Kites are occasionally observed, but are not common, probably only wanderers from Madagascar or the Comoro Islands." (Abbott, MS.)

Family FALCONIDÆ.

29. TINNUNCULUS NEWTONI, Gurney.

Five specimens, October 19–November 7.

"This is not a very common species, only about twenty individuals being observed during my stay of three months in Aldabra. They appear to be most common in the bare and stony interior of Grand Terre, Aldabra, particularly near the water hole at Táta máca." (Abbott, MS.)

Family STRIGIDÆ.

30. STRIX FLAMMEA ——?.

Four specimens, October 4–December 12.

In the absence of sufficient material for comparison, I am unable to determine the subspecies to which these specimens belong. They are very different from an example from Angola (*S. poensis*, Fraser?), the only African Barn Owl in the U. S. National Museum collection, but resemble very closely in coloration *S. f. delicatula*, from Australia, Samoa, etc. They are much larger, however, than the latter.

"This owl is rather common. Its cry is frequently heard at night, and is almost identical with that of the American variety. Occasionally seen in the day time." (Abbott, MS.)

Family CUCULIDÆ.

31. CENTROPUS INSULARIS, Ridgway.[1]

Four specimens, September 25–November 18.

"A common and extremely tame species both in Aldabra and Assumption. Very fond of lizards and, it is said, also of rats. While I did not actually see them capture any of the latter, I believe that they do catch small ones. This bird has two notes, one like *Hoo-hoo-hoo-hoo-*

[1] See also p. 522.

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hoo-hoo-hoo-hoo, high at first, then diminishing lower and lower in tone; it also has a short harsh call note, frequently repeated. Breeds in December, constructing a large oval nest, the size of a peck measure, with the entrance in one end. It is very loosely made of strips of bark, grass, and cocoanut leaves, when they are available, and is placed in a bush five to eight feet from the ground. The number of eggs is three or four, white in color." (Abbott, MS.)

Family CAPRIMULGIDÆ.

32. CAPRIMULGUS ALDABRENSIS, Ridgway.

Caprimulgus aldabrensis, RIDGWAY, Proc. U. S. Nat. Mus., XVII, 1894, p. 373 (Aldabra Island; U. S. N. M.).

Specific characters.—Similar to *C. madagascariensis*, Grandidier, but averaging larger; scapulars marked with grayish white instead of buff; foreneck without collar of buffy spots, and white of tail more extensive (that on lateral feathers extending 1.70 inches from tip in adult male).

Habitat.—Aldabra Island. (Type No. 128668, U.S.N.M., male adult, Aldabra Island, September 29, 1892, Dr. W. L. Abbott.)

Measurements of type.—Length (before skinning), 9.25 inches; wing, 6.25; tail, 4.35; middle toe, 0.65.

"Creole name, '*Sommeil*.' Very common, generally remaining in the jungle during the day, but numbers come around the houses in the evening, being particularly attracted by the swarms of beetles about the bone heaps where the turtles are slaughtered. Breeds on the open sand hills, on the bare ground, in September. Did not find any eggs, but found a nest containing two young.

"This bird has three notes. In the dusk of evening the first call is heard—*kŭ-wŭh'*, *kŭ-wŭh'*, with the accent strongly on the last syllable. After dark the note heard is chūk-tŭ-tŭ-tŭ-tŭ frequently repeated. This sound is rather that of clucking than 'tu-tu,' etc., but can not be more nearly expressed in words. The third sound made by the bird is a sort of *winnowing* similar to the sound made by *Scops asio*. This last is rarely heard." (Abbott, MS.)

Family CORACIIDÆ.

33. EURYSTOMUS GLAUCURUS (Müller).

One specimen, December 10.

"A roller was shot on Ile Picard. I did not see any others, but one of my men, who had lived several years on Aldabra, told me he had several times seen them." (Abbott, MS.)

Family MICROPODIDÆ.

34. MICROPUS APUS (Linnæus).

One specimen, December 1. "One specimen shot on Ile Picard, doubtless a straggler." (Abbott, MS.)

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35. "COLLOCALIA, Sp.?

A swift, apparently of this genus, observed several times, but none were shot." (Abbott, MS.)

Family "TIMELIIDÆ".

36. IXOCINCLA MADAGASCARIENSIS ROSTRATA, Ridgway.

Irocincla madagascariensis rostrata, RIDGWAY, Proc. U. S. Nat. Mus., XVI, 1893, p. 597 (Aldabra Island; U.S.N.M.).

Subspecific characters.—Similar to true *I. madagascariensis* (Müller), but larger, the bill especially, and coloration paler.

Habitat.—Aldabra and Gloriosa islands.

Type.—No. 128658, U.S.N.M., male adult, Aldabra Island, October 2, 1892; Dr. W. L. Abbott. Length (before skinning), 9⅝ inches; wing, 4.50; tail, 4; exposed culmen, 0.82; depth of bill through nostril, 0.28; tarsus, 0.86; middle toe, 0.65. "Bill orange-red, tip black; feet fleshy brown." (Abbott, MS.)

"A common species in the jungle, very noisy and quarrelsome. It has a large variety of notes and *noises*, one of which is like the autumn call note of the American robin. A few were found breeding in December. Nests were placed in the tops of shrubs in the jungle about 8 feet from the ground. Only two eggs were found in any nest, but they possibly lay more." (Abbott, MS.)

Family MOTACILLIDÆ.

37. MOTACILLA CAMPESTRIS, Pallas.

One specimen, December 20. "A single specimen shot on Ile Picard."

Family MUSCICAPIDÆ?

38. MUSCICAPA, sp. (?).

"A small gray flycatcher about 6 inches long, with white rump, noticed at North Island (Aldabra) in December, but was not shot. Doubtless a visitor from Africa or Madagascar." (Abbott, MS.)

Family HIRUNDINIDÆ.

39. PHEDINA BORBONICA (Gmelin)?

One specimen, November 19.

This species is identified with great doubt as *P. borbonica*, but the descriptions of this and *P. madagascariensis* in the British Museum catalogue,[1] as well as in Hartlaub's *Die Vögel Madagascars*,[2] are so unsatisfactory that I am unable to decide to which the Aldabra bird should

[1] Vol. X, pp. 122, 123. [2] Pp. 63–66.

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be referred. Geographical considerations would favor its being *P. madagascariensis;* but the descriptions, so far as they indicate any difference between the two supposed species, rather point to its being *P. borbonica.*

40. CLIVICOLA RIPARIA (Linnæus).

One specimen, December 2. "One specimen shot on Ile Picard; several seen on Gloriosa Island." (Abbott, MS.)

Family NECTARINIIDÆ.

41. CINNYRIS ALDABRENSIS, Ridgway.

Cinnyris aldabrensis, RIDGWAY, Proc. U. S. Nat. Mus., XVII, 1894, p. 372 (Aldabra Island; U.S.N.M.).

Specific characters.—Similar to *C. souimanga* (Gmelin), but pectoral band much broader and bright maroon-bay instead of chestnut; sooty breast-patch much more extensive, reaching, medially, to middle of belly; sides and flanks light yellowish gray, and lower belly very pale sulphur yellow (whole belly canary yellow in *C. souimanga*). Female much grayer above and darker below, anteriorly, than that of *C. souimanga.*

Habitat.—Aldabra Island. (Type, No. 128673, U.S.N.M., male adult, Aldabra Island, October 1, 1892; Dr. W. L. Abbott.)

Measurements of type.—Length (before skinning), 4.36 inches; wing, 2.10; tail, 1.50; exposed culmen, 0.70; tarsus, 0.65; middle toe, 0.40. "Bill and feet black." (Abbott, MS.)

"This, the commonest bird in Aldabra, is found in all localities. Like all other birds of the islands, it is extremely tame and unsuspicious, even alighting on one's arm. It breeds from September to January, possibly longer and at other seasons. More than one brood is raised, but I do not know how many. The female alone performs the labor of nest building and incubation; the male, however, assists in feeding the young. The nest is suspended from a branch of mangrove or of a 'baluchi' bush near the shore; a favorite situation being to fasten it to a stalk of grass or euphorbia hanging in one of the great pits or chasms so numerous in the coral rock of Aldabra. The nest is neatly constructed of fibers of bark, generally mangrove. The female selects a suitable hanging leaf or branch and attaches some fibers of bark firmly to it; other fibers are then attached to this until an oval mass is formed; this is then opened out by the bird entering her head and then her body into the mass. More material is now added to the outside, the bird occasionally entering the cavity and enlarging it by kicking and fluttering; finally the inside is lined with feathers. The construction of the nest occupies about eight days. Two eggs are laid and the period of incubation is thirteen days. The young are born blind, but open their eyes on the seventh day.

"The male has a very sweet song, reminding one of the American house wren, *Troglodytes aëdon.*" (Abbott, MS.)

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Family MELIPHAGIDÆ.

42. ZOSTEROPS ALDABRENSIS, Ridgway.

Zosterops aldabrensis, RIDGWAY, Proc. U. S. Nat. Mus., XVII, 1894, p. 371 (Aldabra Island; U.S.N.M.).

Specific characters.—Similar to *Z. palpebrosa* (Temminck), but supraloral region (sides of forehead) distinctly orange-yellowish, under parts with yellow of chest extending farther backward and tinging the median line of the belly; chest and sides less tinged with gray (some specimens having instead a faint brownish wash), and under tail-coverts very different in color from chest (varying from maize- to chrome-yellow, the throat being canary yellow).

Habitat.—Aldabra Island. (Type, No. 128702, U.S.N.M., male adult, Aldabra Island, October 3, 1892; Dr. W. L. Abbott.)

Measurements of type.—Length (before skinning), 4.25 inches; wing, 2.12; tail, 1.62; exposed culmen, 0.35; tarsus, 0.70; middle toe, 0.37. "Upper mandible black; lower leaden; feet leaden; irides light brown." (Abbott, MS.)

"A very common, active little bird, generally keeping in the thick jungle and constantly hopping about the branches. Found in flocks of twenty to thirty and very fond of the seeds of the casuarina tree. One nest was taken in October, but they breed plentifully in December. The nest is neatly constructed of bark fiber and casuarina needles, usually placed in a bush six feet from the ground in thick jungle. Two pale green eggs are laid." (Abbott, MS.)

Family CORVIDÆ.

43. CORVUS SCAPULATUS, Daudin.

Two specimens, October 30 and November 1.

"Not common on either Aldabra or Assumption. Shyer and more wary than any other bird on these islands. Plentiful on Gloriosa Island, where they are very destructive to the eggs of 'boobies' and other birds." (Abbott, MS.)

Family DICRURIDÆ.

44. BUCHANGA ALDABRANA, Ridgway.

Buchanga aldabrana, RIDGWAY, Proc. U. S. Nat. Mus., XVI, 1893, p. 597 (Aldabra Island; U.S.N.M.).

Specific characters.—Differing from *B. atra* (Hermann) in larger and more strongly hooked bill, much longer nasal plumes (reaching half way from nostrils to tip of bill), much narrower rectrices, and in the very pale coloration of the female.

Type.—No. 128719, U.S.N.M., adult male, Aldabra Island, October 8, 1892; Dr. W. L. Abbott: Entirely black, glossed with greenish blue, the

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remiges and rectrices much duller, more brownish, and very faintly glossed. "Irides red, bill and feet black." Length (before skinning), 11.25 inches; wing, 5.30; tail, 5.55; middle feathers, 4.20; culmen (from extreme base), 1.15; depth of bill through nostril, 0.38; tarsus, 0.92; middle toe, 0.60.

No. 128722, adult female, same locality and collector, October 2, 1892: Above dull slate gray, the margins of the feathers on forehead and hind neck and lower part of rump approaching grayish white; wing-coverts dull greenish slate, indistinctly edged with dull brownish white; remiges and rectrices dull grayish brown, edged with paler. Under parts grayish white, the feathers of the breast, belly, etc., dusky grayish beneath the surface; under wing-coverts almost wholly pure white. Bill, legs, and feet black; "irides reddish brown." Length (before skinning), 9.75 inches; wing, 4.80; tail, 4.80; middle feathers, 4.08; culmen (to concealed base), 1.12; depth of bill through nostril, 0.38; tarsus, 0.90; middle toe, 0.60.

Immature males are variously intermediate in color between the adult male and adult female.

The collection contains three adult males, two immature males, and one adult female, representing dates from October 2–19, inclusive.

"Common, noisy, and quarrelsome, pursuing frigate birds, crows, and other large birds that approach their nests. Breeds in November and December, laying three or four eggs. A favorite situation is on the branch of a casuarina tree. The nest is open, rather flat, and firmly and neatly constructed of casuarina needles and some spider webs." (Abbott, MS.)

Family PLOCEIDÆ.

45. FOUDIA ALDABRANA, Ridgway.

Foudia aldabrana, RIDGWAY, Proc. U. S. Nat. Mus., XVI, 1893, p. 598 (Aldabra Island); U.S.N.M.

Specific characters.—Similar to *F. madagascariensis* (Linnæus), but very much larger.

Type.—No. 128692, U.S.N.M., adult male, Aldabra Island, October 5, 1892; Dr. W. L. Abbott: Head, neck, chest, and upper breast bright scarlet (flame-scarlet on under parts); rest of under parts rather light chrome yellow, tinged with orange on abdomen and with scarlet on the crissum. Lores and orbits black. Back and scapulars light yellowish olive broadly streaked with black; rump plain light tawny olive-brown; upper tail-coverts flame-scarlet. Wings dull blackish, all the feathers margined with light olive or olive-yellowish; tail, olive grayish, the feathers edged with yellowish olive. "Bill black; irides dark brown; feet brownish flesh." Length (before skinning), 6.50 inches; wing, 3.30; tail, 2.10; culmen, 0.75; depth of bill at base, 0.50; tarsus, 0.92; middle toe, 0.65.

No. 128690, U.S.N.M., adult female, same locality and collector,

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October 3: Pileum and hind neck deep olive-buff, narrowly and rather indistinctly streaked with dusky; superciliary stripe, cheeks, and sides of neck light brownish yellow; a postocular streak of dusky; anterior under parts pale Naples yellow (palest on throat), the posterior lower parts deeper yellow. Otherwise like the adult male, but without trace of red anywhere. "Upper mandible horny brown, lower mandible pale horny; feet flesh color." Length (before skinning), 5.50 inches; wing, 3.05; tail, 2.10; culmen, 0.70; depth of bill at base, 0.50; tarsus, 0.85; middle toe, 0.60.

Two other adult males show a mixture of red on the back, and one of them has the lower rump, as well as the upper tail-coverts, red. It is therefore probable that in full plumage this species has the red as extensive as in *F. madagascariensis*.

A young male is like the female described above, but is somewhat brighter yellow beneath.

"A very common species in Aldabra. Nesting in November, December, and January. Builds in casuarina trees, generally near the seashore. Nest made of casuarina needles, somewhat loosely constructed, oval in form, roofed over, with the entrance in the side and suspended from the end of a branch. Number of eggs four. The male assists in the construction of the nest, but not in incubation (?). These birds are very fond of the seeds of the casuarina tree and are also destructive to unripe maize. They are, however, apparently only able to reach the latter after the husks have been gnawed through by rats. They are very tame and familiar, coming in flocks to feed on the crumbs and scraps about the houses." (Abbott, MS.)

APPENDIX.

A.—CATALOGUE OF BIRDS ASCERTAINED TO OCCUR AMONG THE ISLANDS NORTH AND EAST OF MADAGASCAR, FROM THE COMOROS TO THE MASCARENE GROUP.

[Extinct species in heavy-faced type. Introduced species in parentheses. Peculiar species in italics.]

	Reunion.	Mauritius.	Rodriguez.	Seychelles.	Amirantes.	Providence Bank.	Glorioso.	Assumption.	Aldabra.	Mohilla.	Anjuan.	Mayotte.	Grand Comoro.
Family LARIDÆ.													
1. Sterna melanogaster, Temminck	x												
2. Sterna dougalli, Montague	x	x											
3. Sterna media, Horsfield													x
4. Sterna bernsteini, Schlegel			x	x	x	x	x		x				
5. Sterna bergii, Lichtenstein			x	?									
6. Sterna melanauchen, Temminck					x	x	x		x				
7. Sterna minuta, Linnæus				x									
8. Sterna balænarum (Strickland)				x									
9. Sterna anæthetus, Scopoli	x	x	x	x									
10. Sterna fuliginosa, Gmelin		x	x	x			x		x				
11. Anous stolidus (Linnæus)	x	x	x	x	x	x			x				
12. Anous tenuirostris (Temminck)	x	x		x									
13. Gygis alba (Sparrmann)	x	x	x	x	x	x		x	x				

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A.—CATALOGUE OF BIRDS ASCERTAINED TO OCCUR AMONG THE ISLANDS NORTH AND EAST OF MADAGASCAR, ETC.—Continued.

	Réunion.	Mauritius.	Rodriguez.	Seychelles.	Amirantes.	Providence Bank.	Glorioso.	Assumption.	Aldabra.	Mohilla.	Anjuan.	Mayotte.	Grand Comoro.
Family STERCORARIIDÆ.													
14. Megalestris antarcticus (Lesson)				x									
Family PROCELLARIIDÆ.													
15. Ossifraga gigantea (Gmelin)	x												
16. Majaqueus æquinoctialis (Linnæus)	x												
17. Priofinus cinereus (Gmelin)	x												
18. Puffinus tenebrosus, Pelzelu?	x	x		x									
19. Puffinus sphenurus, Gould					x								
20. Puffinus chlororhynchus, Lesson	x	x	x	x									
21. Aestrelata æterrima (Schlegel)	x												
22. Daption capensis (Linnæus)	x												
23. Cymodroma melanogaster (Gould)[1]													
24. Oceanites oceanicus (Kuhl)	x												
25. Prion vittatus (Forster)	x												
26. Pseudoprion banksii (Temminck)											x		
27. Pseudoprion desolatus (Gmelin)	x	x		x									
Family DIOMEDEIDÆ.													
28. Thalassogeron chlororhynchus (Gmelin)	x												
Family DROMADIDÆ.													
29. Dromas ardeola, Paykull				x	x	x	x		x				
Family ARENARIIDÆ.													
30. Arenaria interpres (Linnæus)	x	x	x	x	x	x	x		x		x		
Family CHARADRIIDÆ.													
31. Squatarola squatarola (Linnæus)	x	x		x									
32. Ægialitis geoffroyi, Wagler	x	x		x		x			x				
33. Ægialitis varius (Vieillot)	x	x											
Family GLAREOLIDÆ.													
34. Glareola ocularis, Verreaux		x											
Family SCOLOPACIDÆ.													
35. Tringa minuta, Leisler				x		x							
36. Tringa alpina, Linnæus	?												
37. Tringa ferruginea, Brünnich		x							x		x		
38. Calidris arenaria (Linnæus)									x				
39. Actitis hypoleucos (Linnæus)	x	x		x					x		x		
40. Terekia cinerea (Güldenstadt)		x											
41. Totanus glareola (Linnæus)									x				
42. Totanus nebularius (Gunnerus)				x	x		x		x				
43. Numenius arquata madagascariensis (Linnæus)	x	?	x	x	x				x				
44. Numenius phæopus (Linnæus)	x	x	x	x	x	x	x	x	x				x
Family RALLIDÆ.													
45. **Aphanapteryx broeckii** (Schlegel)		x											
46. **Erythromachus leguati** (A. Milne-Edwards)			x										
47. Hypotænidea pectoralis (Lesson)		x											
48. Dryolimnas cuvieri (Pucheran)		x											
49. Dryolimnas aldabranus (Günther)									x				
50. Dryolimnas abbotti, Ridgway								x					
51. Gallinula chloropus (Linnæus)				x									
52. (?) Gallinula pyrrhorhoa (Grandidier)	x	x											
53. Gallinula sp. indet[2]													
54. Porphyrio porphyrio (Linnæus)	x	x											
55. Porphyriola alleni (Thompson)			x										
56. **Fulica newtoni**, Milne-Edwards		x											
Family ANATIDÆ.													
(57. Anas melleri (Sclater).)	x	x		x?									
(58. Dendrocygna viduata (Linnæus).)		x											

[1] At sea, between Mauritius and Madagascar.

[2] St. Denys.

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A.—CATALOGUE OF BIRDS ASCERTAINED TO OCCUR AMONG THE ISLANDS NORTH AND EAST OF MADAGASCAR, ETC.—Continued.

	Réunion.	Mauritius.	Rodriguez.	Seychelles.	Amirantes.	Providence Bank.	Glorioso.	Assumption.	Aldabra.	Mohilla.	Anjuan.	Mayotte.	Grand Comoro.
Family PHŒNICOPTERIDÆ.													
59. Phœnicopterus erythræus, J. Verreaux ?	...	x	x	...	...	...	...	...	x	...	...	...	...
60. Phœnicopterus minor Geoffroy St.-Hillaire	...	...	...	x?	...	...	...	...	...	...	...	...	...
Family IBIDIDÆ.													
61. Ibis bernieri, Bonaparte	...	...	...	...	...	...	...	...	...	...	...	...	...
62. *Ibis abbotti*, Ridgway	...	...	...	...	...	...	...	...	x	...	...	...	...
Family ARDEIDÆ.													
63. Ardea cinerea, Linnæus	...	...	...	x	x	x	x	...	x	...	...	...	...
64. Demigretta gularis (Bosc)	x	...	...	...	...	...	...	...	x	...	...	x	x
65. Garzetta garzetta (Linnæus)	?	...	...	...	...	...	...	...	...	...	...	...	...
66. Bubulcus bubulcus (Savigny)	?	?	...	x	x	x	...	...	...	...	x	...	...
67. Ardeola comata (Pallas)	...	...	...	...	...	...	...	...	...	...	x	...	...
68. Ardeola leucoptera (Boddaert)	...	x	...	...	...	...	...	...	...	...	x	...	...
69. Butorides atricapillus (Afzelius)	...	x	...	x	x	x	...	...	x	...	x	x	x
70. Nycticorax megacephala (A. Milne-Edwards)	...	...	x	...	...	...	...	...	...	...	...	...	...
71. Ardetta sinensis (Gmelin)	...	...	...	x	...	...	...	...	...	...	...	...	...
Family PELECANIDÆ.													
72. Pelecanus rufescens, Gmelin	...	...	...	...	x	...	...	...	...	...	...	...	...
Family SULIDÆ.													
73. Sula cyanops, Sundevall	...	...	...	...	...	...	x	x	...	...	...	...	...
74. *Sula abbotti*, Ridgway	...	...	...	...	...	...	...	x	...	...	...	...	...
75. Sula leucogastra (Boddaert)	...	...	...	...	x	...	...	...	...	...	...	...	...
76. Sula piscator (Linnæus)	?	x	x	...	x	x	x	x	x	...	...	...	...
Family FREGATIDÆ.													
77. Fregata aquila minor (Gmelin)	x?	x	x	x	...	x	x	x	x	...	...	...	...
78. Fregata ariel (Gould)	...	...	...	...	x	...	...	...	...	...	...	...	...
Family PHAËTONTIDÆ.													
79. Phaëton rubricaudus, Boddaert	...	...	...	...	...	...	x	x	...	...	...	...	...
80. Phaëton candidus, Drapiez	x	x	x	x	...	...	...	...	x	...	...	...	...
Family PHASIANIDÆ.													
(81. Gallus gallus (Linnæus).)	...	...	...	...	...	...	x	...	...	...	...	...	...
(82. Francolinus pondicerianus (Gmelin).)	x	x	x	...	x	...	...	...	...	...	...	...	...
(83. Francolinus chinensis (Osbeck).)	x	x	...	...	...	...	...	...	...	...	...	...	...
84. Margaroperdix madagascariensis (Scopoli)	x	x	...	...	...	...	...	...	...	...	...	...	...
(85. Perdicula argoondah (Sykes))	...	x	...	...	...	...	...	...	...	...	...	...	...
(86. Excalfactoria chinensis (Linnæus).)	...	x	...	...	...	...	...	...	...	...	...	...	...
(87. Coturnix coturnix (Linnæus))	...	...	...	...	...	...	...	...	...	...	x	x	...
Family NUMIDIDÆ.													
(88. Numida mitrata, Pallas)	...	x	x	...	...	...	...	...	...	...	x	x	x
Family DIDIDÆ.													
89. Didus ineptus, Linnæus	...	x	...	...	...	...	...	...	...	...	...	...	...
90. Didus borbonicus (Bonaparte)	x	...	...	...	...	...	...	...	...	...	...	...	...
91. Pezophaps solitarius (Gmelin)	...	...	x	...	...	...	...	...	...	...	...	...	...
Family COLUMBIDÆ.													
92. Alectrœnas rodericana (Milne-Edwards)	...	...	x	...	...	...	...	...	...	...	...	...	...
93. *Alectrœnas pulcherrima* (Scopoli)	...	...	...	x	...	...	...	...	...	...	...	...	...
94. *Alectrœnas sganzini* (Verreaux)	...	...	...	...	...	...	...	...	x	...	x	x	x
95. Alectrœnas nitidissima (Scopoli)	...	x	...	...	...	...	...	...	...	...	...	...	...
96. *Columba pollenі*, Schlegel	...	...	...	...	...	...	...	...	...	...	x	x	x
97. *Nesœnas mayeri* (Marchal)	...	x	...	...	...	...	...	...	...	...	...	...	...
98. Turtur picturatus (Temminck)	x	x	...	x	...	...	...	...	...	...	...	...	...
99. *Turtur aldabranus*, Sclater	...	...	...	...	...	...	...	x?	x	...	...	...	...

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A.—CATALOGUE OF BIRDS ASCERTAINED TO OCCUR AMONG THE ISLANDS NORTH AND EAST OF MADAGASCAR, ETC.—Continued.

	Réunion.	Mauritius.	Rodriguez.	Seychelles.	Amirantes.	Providence Bank.	Glorioso.	Assumption.	Aldabra.	Mohilla.	Anjuan.	Mayotte.	Grand Comoro.
Family COLUMBIDÆ—Continued.													
100. *Turtur comorensis*, E. Newton											x	x	
101. *Turtur coppingeri*, Sharpe							x						
102. *Turtur rostratus*, Bonaparte				x									
103. *Turtur saturatus*, Ridgway					x								
(104. Turtur semitorquatus (Rüppell).)											x	x	
(105. Turtur capicola (Sundevall).)													x
(106. Turtur chinensis (Scopoli).)		x											
(107. Geopelia striata (Linnæus).)	x	x		x									
(108. Tympanistria tympanistria (Temminck & Knip).)												x	x
Family BUTEONIDÆ.													
109. *Circus maillardi* (J. Verreaux)	x										x		
110. Circus æruginosus (Linnæus)				x									
111. Circus macroscelis, A. Newton												x	
112. *Accipiter pusillus*, Gurney											x	x	
113. Accipiter francesii, Smith											x		
114. *Accipiter brutus* (Pollen)												x	
115. Milvus ægyptius (Gmelin)							x		x		x	x	
116. Haliæëtus vociferoides, Des Murs		x											
Family FALCONIDÆ.													
117. Falco peregrinus, Tunstall		x											
118. Falco minor, Bonaparte											x		
119. Falco eleonoræ, Gené		x											
120. Falco newtoni, Gurney									x				
121. *Falco punctatus*, Temminck		x											
122. *Falco gracilis*, Lesson				x									
Family BUBONIDÆ.													
123. Megascops rutilus (Pucheran)												x	
124. *Gymnoscops insularis*, Tristram				x									
125. **Carine murivora** (A. Milne-Edwards)			x										
Family STRIGIDÆ.													
126. **Strix flammea**									x		x		
Family CACATUIDÆ.													
127. **Lophopsittacus mauritianus** (Owen)		x											
Family PSITTACIDÆ.													
128. *Coracopsis comorensis*, Peters											x		x
129. *Coracopsis barklyi*, E. Newton				x							x		x
130. **Necropsittacus rodericanus** (A. Milne-Edwards)			x										
131. **Mascarinus mascarinus** (Linnæus)	x												
132. *Palæornis eques* (Boddaert)	x	x											
133. *Palæornis wardi*, E. Newton				x									
134. *Palæornis exsul*, A. Newton			x										
(135. Agapornis cana (Gmelin).)	x	x	x								x		
Family CUCULIDÆ.													
136. *Centropus insularis*, Ridgway								x	x				
137. Cuculus rochi, Hartlaub		x											
138. *Cuculus sp ?*				x									
Family CAPRIMULGIDÆ.													
139. *Caprimulgus aldabrensis*, Ridgway									x				
Family CORACIIDÆ.													
140. Eurystomus glaucurus (Müller)		x					x		x		x		
Family LEPTOSOMATIDÆ.													
141. Leptosomus discolor (Hermann)											x	x	
142. Leptosomus gracilis, Milne-Edwards & Oustalet													x

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A.—CATALOGUE OF BIRDS ASCERTAINED TO OCCUR AMONG THE ISLANDS NORTH AND EAST OF MADAGASCAR, ETC.—Continued.

	Réunion.	Mauritius.	Rodriguez.	Seychelles.	Amirantes.	Providence Bank.	Glorioso.	Assumption.	Aldabra.	Mohilla.	Anjuan.	Mayotte.	Grand Comoro.
Family MEROPIDÆ.													
143. Merops superciliosus (Linnæus)										x	x	x	x
Family ALCEDINIDÆ.													
144. Corythornis cristata (Linnæus)											x	x	
Family MICROPODIDÆ.													
145. Micropus apus (Linnæus)									x				
146. Tachornis gracilis (Sharpe)												x	
147. Collocalia francica (Gmelin)	x	x		x					x?				
Family MOTACILLIDÆ.													
148. Motacilla campestris, Pallas									x				
Family TIMELIIDÆ.													
149. Ixocincla madagascariensis (Müller)										x	x	x	x
150. *Ixocincla mad. rostrata*, Ridgway							x		x				
151. *Ixocincla borbonica* (Gmelin)	x												
152. *Ixocincla olivacea* (Jardine & Selby)		x											
153. *Ixocincla crassirostris* (E. Newton)				x	x								
154. *Copsychus sechellarum*, A. Newton				x	x								
155. *Bebrornis rodericanus* (E. Newton)			x										
156. *Bebrornis sechellensis* (Oustalet)				x									
157. *Ellisia longicaudata*, E. Newton											x		
158. Bernieria madagascariensis (Gmelin)										x			
Family MUSCICAPIDÆ.													
159. *Terpsiphone bourbonnensis* (Müller)	x												
160. *Terpsiphone corvina*, E. Newton				x									
161. Terpsiphone mutata (Linnæus)												x	
162. *Terpsiphone vulpina* (E. Newton)											x		x
163. *Pratincola tectes* (Gmelin)	x												
164. Musicapa (?) sp. undetermined									x				
Family TURDIDÆ.													
165. *Merula (?) bewsheri* (E. Newton)											x		
Family LANIIDÆ.													
166. Artamia bicolor (Linnæus)													x
Family DICRURIDÆ.													
167. Buchanga waldeni (Schlegel)												x	
168. *Buchanga aldabrana*, Ridgway									x				
169. Edolius forficatus (Linnæus)											x		
Family CAMPEPHAGIDÆ.													
170. *Lalage newtoni* (Pollen)	x												
171. *Lalage rufiventer* (Swainson)		x											
Family HIRUNDINIDÆ.													
172. *Phedina borbonica* (Gmelin) ?	x	x							x?				
173. Clivicola riparia (Linnæus)							x		x				
Family NECTARINIIDÆ.													
174. Cinnyris souimanga (Gmelin)							x						
175. *Cinnyris aldabrensis*, Ridgway									x				
176. *Cinnyris abbotti*, Ridgway								x					
177. *Cinnyris comorensis*, Peters											x		
178. Cinnyris notata (Müller)													x
179. *Cinnyris dussumieri* (Hartlaub)				x									
180. Cinnyris coquerellii (Verreaux)												x	

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A.—CATALOGUE OF BIRDS ASCERTAINED TO OCCUR AMONG THE ISLANDS NORTH AND EAST OF MADAGASCAR, ETC.—Continued.

	Réunion.	Mauritius.	Rodrigues.	Seychelles.	Amirantes.	Providence Bank.	Glorioso.	Assumption.	Aldabra.	Mohilla.	Anjuan.	Mayotte.	Grand Comoro.
Family MELIPHAGIDÆ.													
181. *Zosterops aldabranus*, Ridgway									x				
182. *Zosterops anjuanensis*, E. Newton											x		x
183. *Zosterops madagascariensis gloriosæ*, Ridgway							x						
184. *Zosterops semiflava*, E. Newton				x									
185. *Zosterops mayottensis*, Schlegel												x	
186. *Zosterops olivacea* (Linnæus)	x												
187. *Zosterops chloronota* (Vieillot)		x											
188. *Zosterops modesta*, E. Newton				x									
189. *Zosterops mauritiana* (Gmelin)		x											
190. *Zosterops borbonica* (Gmelin)	x												
191. *Zosterops e. newtoni*, Hartlaub	x												
192. *Zosterops kirki*, Shelley													x
Family CORVIDÆ.													
193. Corvus scapulatus, Daudin							x	x	x		x	x	
Family STURNIDÆ.													
(194. Acridotheres tristis (Linnæus).)	x	x		x									
195. **Fregilupus varius** (Boddaert)	x												
196. **Necropsar rodericanus** (Gunther & E. Newton)			x										
Family PLOCEIDÆ.													
(197. **Spermestes cucullata** (Swainson).)											x		x
(198. Sporæginthus amandava (Linnæus).)	x	x											
(199. Padda oryzivora (Linnæus).)	x	x											
(200. Munia punctulata (Linnæus).)	x	x											
(201. Estrilda astrilda (Linnæus).)	x	x			x								
(202. Foudia madagascariensis (Linnæus).)	x	x		x	x					x	x		
203. *Foudia aldabrana*, Ridgway									x				
204. *Foudia flavicans*, E. Newton			x										
205. **Nesocanthus bruante** (Müller)	x												
206. *Nesocanthus eminentissima* (Bonaparte)										x	x	x	x
207. *Nesocanthus rubra* (Gmelin)		x											
208. *Nesocanthus sechellarum*, E. Newton				x									
Family FRINGILLIDÆ.													
(209. Passer domesticus (Linnæus).)													x
(210. Passer indicus, Jardine & Selby)	x	x			x								
(211. Serinus canicollis (Swainson).)	x	x											
(212. Serinus icterus (Bonnaterre).)		x			x								

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B.—Bibliography.

Papers consulted in the preparation of the foregoing list.

1864. SCLATER, P. L. On the birds of the Comoro Islands.

The Ibis, 1st ser., VI, 1864, pp. 292–301, Pl. VII.

Twenty-three species are mentioned, of which *Nectarinia comorensis* is described as new (p. 299). The plate (VII) represents *Accipiter francesi*, Smith. The introductory matter (pp. 292–297) comprises a very interesting description of the several islands and their products.

1867. NEWTON, EDWARD, M. A., etc. On the Land-Birds of the Seychelles Archipelago.

The Ibis, 2d ser., III, 1867, pp. 335–358, Pl. IV.

Thirty-five identified species are mentioned, accompanied by very interesting notes. The following are described as new: (1) *Coracopsis barklyi* (p. 341); (2) *Palæornis wardi* (p. 341); (3) *Hypsipetes crassirostris* (p. 344); (4) *Zosterops modesta* (p. 345); (5) *Tchitrea corvina* (p. 349); (6) *Foudia sechellarum* (p. 353), and (7) *Zosterops semiflava* (p. 354).

The plate (IV) represents *Tchitrea corvina*, ♂ and ♀.

1877. NEWTON, EDWARD, M. A., C. M. G., etc. On a collection of birds from the island of Anjuan.

Proc. Zool. Soc., London, 1877, 295–302, Pls. XXXIII, XXXIV.

Twenty-seven species are mentioned, with annotations, of which the following are new: (1) *Zosterops anjuanensis*, p. 297, pl. 33, fig. 1; (2) *Tchitrea vulpina*, p. 298, pl. 33, fig. 2; (3) *Ellisia longicaudata*, p. 299; (4) *Turdus bewsheri*, p. 299, pl. 34; (5) *Turtur comorensis*, p. 300.

A list of forty-six species (three of them undetermined) is given, showing, in tabular form, their distribution among the islands of the Comoro group.

1878. OUSTALET, M. E. Étude sur la faune ornithologique des îles Seychelles.

Bull. Soc. Philomath., Paris, 1878, p. 161.

(Based on a collection of 595 specimens, representing 14 species, made by M. de l'Isle, naturalist of the French Transit Expedition of 1875.) *Ellisia sechellensis* is described as new.

1879. [EDITORIAL.] Oustalet on the Ornithology of the Seychelles.

The Ibis, 4th ser., III, 1879, p. 97.

Review of Oustalet's "Étude sur la faune ornithologiques des îles Seychelles."

1879. GÜNTHER, A. On the occurrence of a Land Rail (*Rallus*) in the island of Aldabra.

Ann. and Mag. Nat. Hist., ser. 5, III, 1879, p. 164.

Described as a new subspecies, *Rallus gularis*, var. *aldabrana*.

1879. SHELLEY, G. E. On a collection of birds from the Comoro Islands.

Proc. Zool. Soc., London, 1879, 673–679.

Thirty-six species are mentioned, of which *Zosterops kirki*, from Grand Comoro, is described as new (p. 676).

1884. SHARPE, R. BOWDLER. Collections from the Western Indian Ocean. Birds.

Report of the Zoological collections made in the Indo-Pacific Ocean during the voyage of H. M. S. Alert, 1881–82, Part II, pp. 483–485.

Fifteen species of birds are mentioned from the Amirante group, Glorioso, and Seychelles.

1888. NEWTON, SIR EDWARD, K. C. M. G., etc. [Presidential address to the members of the Norfolk and Norwich Naturalists' Society, including a "List of the birds of the Mascarene Islands, including the Seychelles."]

Trans. Norfolk and Norwich Naturalists' Soc., IV, pp. 537–554 (list on pp. 548–554).

One hundred and seven species are given in the list, their distribution (whether found in La Réunion, Mauritius, Rodriguez, Seychelles, or "other places within the range") being shown in columns, and whether extinct, peculiar, or of accidental occurrence indicated by symbols. Seven additional species, all *Tubinares*, are given on the authority of Pollen (Recherches, etc., pp. 144, 145), and finally "an approximate list of species of birds which seem to have been introduced into the islands," twenty-one in number.

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1888. NEWTON, SIR EDWARD—Con'd.
The address proper treats largely of the extermination of birds, with special reference to the geographical area covered by the list.

1893. RIDGWAY, ROBERT. Descriptions of some new birds collected on the islands of Aldabra and Assumption, northwest of Madagascar, by Dr. W. L. Abbott.
Proc. U. S. Nat. Mus., XVI, No. 953, August 16, 1893, pp. 597–600.
The new species and subspecies described are as follows:
From Aldabra: (1) *Ixocincla madagascariensis rostrata* (p. 597); (2) *Buchanga aldabrana* (p. 597); (3) *Foudia aldabrana* (p. 598); (4) *Rougetius aldabranus*, p. 598; (5) *Ibis abbotti* (p. 599).
From Assumption: (6) *Sula abbotti*, p. 599.

1893. RIDGWAY, ROBERT—Continued.
From Ile Poivre, Amirante group: (7) *Turtur saturatus*, p. 600.

1894. RIDGWAY, ROBERT. Descriptions of some new birds from Aldabra, Assumption, and Glorioso islands, collected by Dr. W. L. Abbott.
Proc. U. S. Nat. Mus., XVII, No. 1008, 1894, pp. 371–373.
The new forms described are the following:
From Aldabra: (1) *Zosterops aldabrensis*, p. 371; (2) *Cinnyris aldabrensis*, p. 372; (3) *Centropus insularis* (also from Assumption), p. 373; (4) *Caprimulgus aldabrensis*, p. 373.
From Assumption: (5) *Cinnyris abbotti*, p. 372.
From Glorioso: (6) *Zosterops madagascariensis gloriosæ*, p. 372.

Papers not accessible to the author, the titles having been obtained from various sources.

——. Recherches sur la Faune de Madagascar et de ses Dépendances, d'après les découvertes de François P. L. Pollen et D. C. van Dam. (SCLATER.)

1861. DR. G. HARTLAUB. Ornithologischer Beitrag zur Fauna Madagascar's, mit Berücksichtigung der Inseln Mayotta, Nossi-Bé und St. Marie, sowie der Mascarenen und Seychellen. 8vo. Bremen, 1861. (SCLATER.)

1883. COPPINGER, R. W., M. D. Four years in Patagonian, Polynesian, and Mascarene waters (1878–1882). Royal 8vo. London, 1883. (SCLATER.)

1883. COPPINGER, R. W.—Continued.

1887. EDWARDS, A. MILNE, and OUSTALET, E. Observations sur quelques espèces d'oiseaux récemment découvertes dans l'île de la Grande-Comoro.
Ann. Sci. Nat. (*Zool.*) (VII), 2, pp. 213–238.

1889. EDWARDS, A. MILNE, and OUSTALET, E. Études sur les mammifères et les Oiseaux des îles Comores.
N. Arch Mus. [pp. 226–297, Pls. IV–IX.]

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DESCRIPTIONS OF TWO NEW SUBSPECIES OF THE DOWNY WOODPECKER, DRYOBATES PUBESCENS (LINNÆUS).

By HARRY C. OBERHOLSER.

THE comparison of a series of *Dryobates pubescens* from Alaska with a similar series of specimens from Florida reveals at once a striking difference between the representatives of this species from these widely separated localities; the birds from the northern half of the eastern United States being in every respect perfectly intermediate between these two extremes. The Florida birds present the minimum of size, combined with dullness of coloration; while those from Alaska are largest, the light-colored portions of the plumage being of greater extent and pure white.

It therefore becomes necessary either to entirely disregard the evident geographical variation here exhibited, or to recognize instead of one, three races of *Dryobates pubescens* in northern and eastern North America. It is, however, not without considerable hesitation, and only after the careful examination and comparison of a large number of specimens (altogether 200), that the writer has decided to attempt to characterize these subspecies.[1]

While the differences assigned are perhaps not such as to positively determine by any single character every given individual, yet the average distinctions are readily appreciated upon comparison, and the diagnoses are based upon what may be considered fairly well differentiated averages.

For the form of Downy Woodpecker inhabiting the Gulf States there is already a name available, as follows:

DRYOBATES PUBESCENS MERIDIONALIS (Swainson).

SOUTHERN DOWNY WOODPECKER.

Picus pubescens, LINNÆUS, Syst. Nat., Ed. 12, 1766, I, 175 (*part*).
Picus (Dendrocopus) meridionalis, SWAINSON, Fauna Bor. Amer., II, 1831, 308.
Picus le contei, JONES, Ann. Lyc. N. Y., IV, 1857, 489, pl. XVII (Georgia, three-toed specimen).
D[ryobates] pubescens, CABANIS, Mus. Hein., IV, June 15, 1863, 62 (*part*).

Subspecific characters.—Similar to *Dryobates pubescens*, but smaller; the lower parts more brownish, the white markings of wings and tail averaging of less extent.

[1]The writer takes this occasion to express to Mr. Robert Ridgway, of the National Museum, his indebtedness for many favors incident to the preparation of the present paper. To Dr. J. A. Allen and Mr. F. M. Chapman, of the American Museum of Natural History, and to Messrs. William Brewster and Gerrit S. Miller, jr., as well, obligations are acknowledged for courtesy in regard to the loan of specimens.

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Description.—Adult male (No. 150139, U.S.N.M., Lake Arbuckle, Polk County, Florida, March 7, 1895; William Palmer). Upper parts black; nasal feathers yellowish white, slightly mixed with black; superciliary and dorsal stripes, together with stripe on the side of the head and spotting on wings, white. Middle tail-feathers black; next pair black, with very slight white edging on terminal portion of outer webs; remaining tail-feathers white, more or less varied with black. Under surface pale brownish; lower tail-coverts well marked with black. No white tips to the five outer primaries. A red nuchal band.

Length, 152.4 mm.; extent, 283.7 mm.; wing, 86.4 mm.; tail-feathers, 53.3 mm.; exposed culmen, 15.5 mm.; tarsus, 15.2 mm.; middle toe with claw, 15.2 mm.

Habitat.—South Atlantic and Gulf States, from South Carolina to Texas.

This form was first described from Georgia, by Swainson,[1] who mentioned its small size and the darker color of the lower parts in contrast to *D. pubescens;* but having only two specimens for examination he very cautiously expressed his doubt in regard to its validity.

The amount of white on the wings and tail of *D. pubescens meridionalis* is, in a majority of the specimens examined, somewhat less than in *D. pubescens*, the difference being most appreciable on the tips of the primaries and on the outer of the two middle pairs of tail-feathers. The darker appearance of the under parts in specimens from the Southern States is usually quite apparent, although the whitest individuals from Florida are almost indistinguishable in this respect from some specimens of *D. pubescens.* The birds of a small series from Gainesville, Florida, collected by Mr. F. M. Chapman, are darker than any of the others examined, and would appear to be somewhat adventitiously stained, as evidently are some specimens of *D. pubescens* from the coal regions of Pennsylvania and northern Ohio.

With regard to size, the birds from Florida are smallest, the average measurements of 42 adults from that State being as follows: Wing, 88.6 mm.; tail-feathers, 56.1 mm.; exposed culmen, 15.2 mm.; tarsus, 15.2 mm.; middle toe with claw, 15.2 mm. Specimens from the other Gulf States, together with those from South Carolina and Georgia, are slightly larger than Florida birds, but are not otherwise noticeably different.

The birds at hand from North Carolina, Tennessee, Indian Territory, southern Illinois and extreme southern Virginia, appear to be intermediate between *D. pubescens meridionalis* and *D. pubescens;* and these, although not above included, are perhaps without impropriety referable to *D. pubescens meridionalis.*

[1] Fauna Bor. Amer., II, 175.

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DRYOBATES PUBESCENS NELSONI,[1] new subspecies.

NORTHERN DOWNY WOODPECKER.

Subspecific characters.—Similar to *Dryobates pubescens*, but averaging larger; the under parts pure white instead of brownish; the lower tail-coverts and outer tail-feathers averaging with much less of black markings; red nuchal band of male averaging somewhat wider.

Description.—Adult male (Type No. 75654 U.S.N.M., Nulato, Alaska, E. W. Nelson). Above black; nasal feathers yellowish white, slightly mixed with black. Superciliary stripe, streak on cheeks extending nearly around the neck behind, wide dorsal stripe, spots on the wing quills and their coverts, together with the comparatively broad tips to most of the primaries, white. Frontal feathers conspicuously varied with white markings. Middle pair of tail-feathers black; next pair tipped, and on apical half broadly edged externally with white; third pair much more extensively white; the two outer pairs white with exception of their extreme bases under the coverts and a few small spots of black on the terminal portions. Under parts pure white; the few dark markings on lower tail-coverts linear and indistinct. Nuchal band scarlet vermilion.

Measurements.—Wing, 99.1 mm.; tail-feathers, 69.1 mm.; exposed culmen, 16.5 mm.; tarsus, 15.5 mm.; middle toe with claw, 15.2 mm.

Female similar to male, but lacking the red nuchal band and the white markings of the forehead.

Habitat.—Alaska and northern British America.

In a series of fifteen specimens in the collection of the U. S. National Museum the characters given above are fairly constant. Three birds from Kadiak are smaller than all but one of the other Alaska specimens, and have more black on the outer tail-feathers. In this latter respect the Kadiak birds are, however, closely approached by two of the Alaska specimens, and by two others, from Fort Resolution and Moose Factory respectively. A specimen from Victoria County, New Brunswick (Amer. Mus., No. 61362), is also very similar to these, but is smaller.

Of the 15 specimens above mentioned, only one (No. 95275, U.S.N.M., from Kadiak) shows dark markings on the under tail-coverts equaling in amount those on average examples of *D. pubescens*. While some individuals of *D. pubescens*, especially those from the northern United States, are fully as pure white below as are the specimens of *D. pubescens nelsoni*, yet the ordinary coloration of the former is much more brownish.

The white mottling of the forehead seen in the males of *D. pubescens nelsoni*, though not a diagnostic mark, is present to a greater or less degree in 6 of the 12 males of this form; while of the 100 specimens of

[1] Named for Mr. E. W. Nelson, in recognition of his valuable contributions to Alaskan ornithology.

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D. pubescens examined, there were found only four (males) which possessed any indication of such markings.

In *D. pubescens nelsoni* the red nuchal band of the male averages wider than in *D. pubescens*, 12 specimens of each form giving an average of 8.8 mm. for the former, and 7.5 mm. for the latter.

Comparative measurements (in millimeters) of the three forms here treated are given in the subjoined tables:

Dryobates pubescens meridionalis (64 specimens).

	Wing.	Tail feathers.	Exposed culmen.	Tarsus.	Middle toe with claw.
Minimum	84.3	49.5	13.7	14	13.5
Maximum	94.7	61	17.5	16.8	16.8
Average	89.1	55.9	15.5	15.5	15.2

Dryobates pubescens (49 specimens).

	Wing.	Tail feathers.	Exposed culmen.	Tarsus.	Middle toe with claw.
Minimum	90.2	54.6	13.5	13.5	14
Maximum	99.1	67.3	18.3	17	17.8
Average	94.7	61.5	15.5	15.7	15.7

Dryobates pubescens nelsoni (15 specimens).

	Wing.	Tail feathers.	Exposed culmen.	Tarsus.	Middle toe with claw.
Minimum	92.2	58.4	15.2	15	15
Maximum	103.6	74.9	17.3	17.3	17.3
Average	98.8	66.8	16.3	15.7	15.7

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PRELIMINARY DESCRIPTION OF A NEW SUBGENUS AND SIX NEW SPECIES AND SUBSPECIES OF HARES, FROM THE MEXICAN BORDER OF THE UNITED STATES.[1]

By EDGAR A. MEARNS, M. D.,
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THE GENUS *Lepus* stands so much in need of a thorough revision, that, in order to characterize the new species intelligently, it is necessary to define the characters of the remaining species of this region.

The eleven species of the Mexican border, together with their seven additional subspecies, belong to four sections of the genus *Lepus*, at least three of which may with advantage be recognized as subgenera. One of these sections contains the water hare (*Lepus aquaticus*, Bachman) of the lowlands bordering the Gulf of Mexico, another the cottontails (three species), from which the cactus rabbit (*Lepus cinerascens*, Allen) of the Pacific Coast region is sufficiently different to merit separation as a third section, the Mexican jackrabbits (six species) composing the fourth. These groups may be conveniently characterized, anatomically, as follows:

ANALYSIS OF THREE SUBGENERA OF LEPUS.

A. Interparietal persistent as a distinct bone in adults; usually developed from a single ossific center. Ear shorter than hind foot (except in *L. cinerascens*).
   a. Skull and teeth massive; rostral portion about as wide as high; postorbital process of frontal bone anchylosed with the cranium for its entire length; frontal and parietals deeply pitted; skull rather straight above, about half as wide as long; pelage harsh; head small; ear, tail, and hind foot short, the latter scantily haired..... *Hydrolagus*, Gray.

[1] This is the third of a series of papers, in the Proceedings of the United States National Museum, based on the collection of mammals made by the writer in connection with the recent resurvey of the Mexican boundary line, in which it has been deemed advisable to present brief preliminary diagnoses of such mammals as appear to be new to science, in anticipation of the publication of the proposed report on the collections of the International Boundary Commission, United States and Mexico. This course is necessitated by the delay incident to getting out the final report, in which detailed descriptions and illustrations of the new forms may be expected. (See Proc. U. S. Nat. Mus., XVII, pp. 129–130; XVIII, pp. 443–447.)

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aa. Skull and teeth lighter; rostral portion wider than high; postorbital processes united with the cranium behind (in old specimens), inclosing a narrow foramen; upper surface of skull much less pitted; skull much arched above, sometimes wider than one-half of its length; pelage softer and longer; feet densely padded; head, ears, tail, and feet relatively larger. *Sylvilagus*, Gray.[1]

AA. Interparietal distinct only in the fetus, and for a short period after birth; always obliterated in adults; usually developed from two ossific centers; skull low and narrow, its breadth considerably less than half the length, with large, arching postorbital processes, which are united to the cranium by suture posteriorly, inclosing a long and wide foramen; nasal bones long; anterior upper incisors rounded externally, and without a distinct lateral groove. Ear longer than hind foot; tail black above, this color running up on the rump. Pelage never white..... *Macrotolagus*.[2]

The species and subspecies of *Lepus* at present known to inhabit the region of the Mexican border may be determined by reference to the following key:

ANALYTICAL KEY TO THE SPECIES AND SUBSPECIES OF LEPUS FOUND ON THE MEXICAN BORDER OF THE UNITED STATES, INCLUDING THE LEPUS CALLOTIS, WAGLER, OF MEXICO.

A. Interparietal persistent as a distinct bone in adults; usually developed from a single ossific center. Ear shorter than hind foot (except in *L. cinerascens*).

a. Skull and teeth massive; superior outline moderately convex; postorbital process of frontal bone anchylosed with the cranium for its entire length, "leaving neither foramen, notch, nor suture;" frontal and parietals deeply pitted; skull about half as wide as long, with the muzzle about as wide as high; pelage harsh; feet scantily clothed; head small; ears, tail, and hind feet relatively short (= *Hydrolagus*, Gray)..... *aquaticus*.[3]

aa. Skull and teeth lighter; superior outline strongly convex posteriorly; postorbital process united with the cranium behind (in old specimens), inclosing a foramen; upper surface of skull much less pitted, about as wide as long, with the muzzle usually wider than high; pelage softer and longer, especially on the feet, which are heavily padded; head, ears, tail, and feet relatively larger (=*Sylvilagus*, Gray).

b. Ear longer than hind foot; tail short; skull narrow, low, and lightly ossified, with postorbital process usually free, scarcely touching cranium behind..... *cinerascens*.

[1] *Lepus cinerascens*, Allen, an aberrant species, is provisionally referred to a second section of this subgenus. (See key to species.)

[2] *Macrotolagus*, new subgenus. Type *Lepus alleni*, Mearns, from southern Arizona and adjacent parts of Mexico.

[3] This has recently become *Lepus aquaticus attwateri*, Allen, Bull. Am. Mus. Nat. Hist., N. Y., VII, Art. X, November 8, 1895, pp. 327, 328. Type locality: Medina River, 18 miles south of San Antonio, Texas.

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bb. Ear shorter than hind foot; tail longer than in the preceding section; skull stouter, higher, and heavier, with postorbital process united with the cranium behind.

c. Ear shorter than head.

d. Skull high, size small; tail very short; hind foot short and scantily clothed; ear small. Length, 370 mm.; tail vertebræ, 50; ear above crown, 70; hind foot, 82. *bachmani.*

dd. Skull not so high; size larger; tail, ears, and hind feet larger, the latter heavily coated with long hair.

e. Skull lightly ossified, with audital bullæ much inflated, mandible small, dentition weak, and rostral portion of skull abbreviated; nasals falling considerably short of the premaxillaries; ears heavily coated with long hair; color dark. Length, 425 mm.; tail vertebræ, 58; ear above crown, 64; hind foot, 105..... *pinetis.*

ee. Skull and dentition heavier; audital bullæ small, mandible large; nasals and rostral portion of skull elongated, the former exceeding the premaxillaries; ears less heavily clothed with short hair; coloration light. Length, 415 mm.; tail vertebræ, 67; ear above crown, 80; hind foot, 100. *holzneri* (p. 554).

cc. Ear longer than head.

f. Skull low and narrow, with rostral portion elongated; audital bullæ moderately inflated, shorter antero-posteriorly than the upper molar series; size large; ears broadly tipped with black; color of upper surface tawny olive, mixed with gray and black. Length, 400 mm.; tail vertebræ, 67; ear above crown, 90; hind foot, 92..... *auduboni.*

ff. Skull higher and broader, with rostral portion reduced; audital bullæ much inflated, longer antero-posteriorly than the upper tooth-row; size small; ears narrowly tipped with black; color of upper surface pale yellowish brown, mixed with gray and black.

g. Size large; coloration dark. Length, 380 mm.; tail vertebræ, 55; ear from crown, 85; hind foot, 92. *major* (p. 557).

gg. Size small; coloration light.

h. Larger; ears and tail relatively long. Length, 360 mm.; tail vertebræ, 60; ear above crown, 85; hind foot, 82..... *arizonæ.*

hh. Smaller; ears and tail relatively short; skull with rostral portion, mandible, and audital bullæ relatively more developed. Length, 330 mm.; tail vertebræ, 50; ear above crown, 80; hind foot, 80..... *minor* (p. 557).

AA. Interparietal only present in the fetus, and for a very short period after birth; always fused with the parietals in adults, and usually developed from two ossific centers. Ear longer than hind foot.

i. Convex surface of ear white at the apex; black patch on middle of rump tending to become obsolete.

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j. Nape and base of ear black ..... *callotis.*

jj. Nape and base of ears sooty grayish or yellowish.

k. Sides white; size small; head stout; ears moderate. *gaillardi* (p. 560).

kk. Sides gray; size large; head slender; ears enormous. *alleni.*

ii. Convex surface of ear black at the apex; rump with a distinct black median stripe, in continuation of the black upper surface of the tail.

l. Nape and base of ears black ..... *merriami* (p. 558).

ll. Nape and base of ears never black, usually paler than or concolor with the body.

m. Haunches and sides of rump distinctly whitish or pale grayish, in sharp contrast with the dark coloring of the back.

n. Size medium; ears small (under 150 mm. from crown) with ochraceous fringes anteriorly; upper surface of body vinaceous cinnamon.. *melanotis.*

nn. Size small; ears larger (over 150 mm. from crown) with brownish white fringes anteriorly; upper surface of body brownish gray. *griseus* (p. 562).

mm. Haunches and sides of rump not distinctly whitish, but suffused with the dark coloring of the back.

o. Head stout; black of upper surface aggregated so as to form blotches; under surface mostly white.

p. Size large (total length, 620 mm.; ear from crown, 170; hind foot, 145); colors, grayish above, white below ..... *texianus.*

pp. Size small (total length, 580 mm.; ear from crown, 160; hind foot, 130); colors, more brownish on sides, sometimes stained with yellowish below ..... *eremicus.*

oo. Head slender; black of upper surface evenly distributed, not forming dusky blotches; under surface stained with yellowish or cinnamon.

q. Colors pale; upper surface grayish or clay color, but slightly mixed with black; ears pale drab, large (averaging 165 mm. from crown); under parts lightly tinged with ochraceous buff (sometimes whitish). *deserticola* (p. 564).

qq. Colors dark; upper surface drab, mixed with gray and considerable black; ears dark drab, small (averaging 155 mm. from crown); under parts strongly tinged with cinnamon. *californicus.*

LEPUS SYLVATICUS HOLZNERI, new subspecies.

HOLZNER'S COTTONTAIL.

Geographic distribution.—This cottontail was first met with in the red juniper zone of the Carrizalillo Mountains—the first wooded range on the boundary west of the Rio Grande. The Indians, who distinguish it from the cottontail of the plains of that region (*Lepus arizonæ*

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minor), said it was the common rabbit of the Boca Grande and other mountain ranges of the surrounding region, and this proved to be the case as we proceeded westward. It was subsequently found in the Hachitas, Dog, San Luis, Animas, Guadalupe, Mule, San José, and Huachuca mountains. It was found from the red junipers and oaks at the lower timber line to the highest summits of these mountains, and was generally abundant. To the northward I have only seen it in the forested area bordering the south side of the Colorado River, in northern Arizona. It is the "wood rabbit" of Arizona and New Mexico; *Lepus arizonæ* being an inhabitant of the plains and deserts.

Description of type.—In summer pelage. Well clothed with coarse, rather short overhair, which conceals the underfur. Color of back, hip patches, and upper side of head vinaceous cinnamon, mixed with gray and black, deepening to tawny on the nape, and changing to clear whitish gray on the thighs and rump, which are lined with black; under parts white, faintly stained with yellowish, with the chest patch clay color, and inguinal spots pale vinaceous cinnamon; tail grizzled yellowish brown above, white below. Ears clothed with short hair, without black at tip or on anterior border; convex surface almost bare posteriorly, mixed reddish brown, gray and black anteriorly, fringed with white on basal two-thirds of anterior border, and scantily clothed with whitish hairs on the concave surface. Top and sides of head reddish like the back, pale around the orbit and at base of ears, posteriorly. Anterior face of fore limbs and outer face of hind limbs tawny, their inner surface brownish white.

Description of winter pelage (based on No. $\frac{20336}{35537}$, United States National Museum).—Adult male, from the Carrizalillo Mountains, near monument No. 31, Mexican boundary line. Collected April 21, 1892, by Mearns and Holzner. (Original number, 1680.[1]) Coat long, coarse, and rigid; feet bushy; ears well clothed. Color above gray, lined with black, faintly washed with clay color on back, hip patches, and along the ventral border; sides, rump, and haunches clear gray, lined with black; under parts with the pectoral area grayish white, tinged with clay color, the small flank patches clay color, and residue of under surface, including the under side of tail, pure white. The ears have their inner (concave) surface clothed with short grayish white hairs, the outer (convex) surface being grayish white posteriorly, gray mixed with black anteriorly, narrowly banded with black on the terminal half, and fringed with white on the edge. The nape is russet, orbital region whitish, and top and side of head gray, very faintly washed with yellowish brown. The feet are clay color on the under side, whitish above, tawny higher up on the shank. The upper side of the tail is grayish brown, with hoary tips to the hairs, the edges white.

[1]This specimen was at one time supposed to represent a form sufficiently different from more western specimens to warrant its separation from *holzneri*, to constitute a subspecies *rigidus*, characterized by smaller size, coarser pelage, and slightly grayer coloration, having for its range the Eastern Desert Tract.

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An adult male in recently acquired winter dress (No. 2425, Amer. Mus. Nat. Hist., New York), taken by the writer in the Great Colorado Forest, at Pine Springs, near the Colorado River, in northern Arizona, on November 15, 1884, is practically identical in coloration with the above described specimen. In both, the pelage is gray at base for half its length, then brown, then narrowly ringed with black and drab gray, successively, and tipped with black. It is slightly larger, with a denser, softer coat. This specimen was compared with the types of *Lepus sylvaticus pinetis*, and found to be distinct.

A detailed account of the variations in the pelage of this species which depend on season, molting, age, and locality will be deferred until the publication of the report on the mammalogy of the recent survey of the boundary.

Dimensions.—Average measurements of 6 adult males: Total length, 415.2 mm.; tail vertebræ, 64; ear from crown, 77.8; ear from notch, 65; length of hind foot, 99.5; length of head (from nose to occiput), 82. Average of 7 adult females: Total length, 413.3 mm.; tail vertebræ, 69.6; ear from crown, 79.4; ear from notch, 68; hind foot, 97; head, 82.3.

Cranial and dental characters.—The nasals and rostral portion of the skull are relatively larger than in any other cottontail, the former usually extending beyond the line of the premaxillaries. The audital bulla is small, and the mandible of medium size. The dental armature is rather heavy.

Type.—No. 58937, U.S.N.M. (Coll. International Boundary Commission). Adult female, from the Douglas spruce zone, near the summit of the Huachuca Mountains, southern Arizona. Collected August 29, 1893, by Mr. Frank X. Holzner. (Original number, 989.)

General remarks.—This rabbit is quite different in color from *L. bachmani* or *L. s. nuttalli*, and is much larger than either of them. It is, in fact, the largest cottontail in the Southwest, excepting *Lepus auduboni*, from which it may be instantly distinguished by its much shorter ear, longer hind feet, and wholly different coloration. I have compared Holzner's cottontail very carefully with the *Lepus pinetis* recently described by Dr. J. A. Allen,[1] from the White Mountains, Arizona, and find it to be very different, though, as remarked by Dr. Allen, one of the specimens is immature, and the other in such worn molting pelage as to show but little of the overhair. Though unsatisfactory in character, these specimens indicate a form very different from any previously described. The large, bushy feet and heavily clothed ears are quite similar to those of *Lepus sylvaticus nuttalli*; but, instead of the pallid, hoary, and yellowish coloring of that animal, it is the darkest form of cottontail in the Southwest, the young specimen (No. $\frac{2}{7}\frac{0}{3}\frac{4}{3}\frac{1}{6}$, Am. Mus. Coll.) being about as dark as the darkest individuals of the cactus rabbit (*Lepus cinerascens*). Fortunately the skulls of the two specimens of *Lepus sylvaticus pinetis* are perfect, and that of the adult (No. $\frac{2}{7}\frac{0}{3}\frac{4}{3}\frac{0}{5}$, Am. Mus. Coll.) indicates a

[1] Bull. Am. Mus. Nat. Hist., VI, p. 348, December, 1894

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form widely different from *L. holzneri*, bearing, in fact, a closer resemblance to the skull of the *Lepus arizonæ*.

LEPUS ARIZONÆ MAJOR, new subspecies.

GREATER DESERT COTTONTAIL.

Geographic distribution.—This rabbit occupies the elevated interior region, between the eastern and western deserts, its range extending along the Mexican boundary from Poso de Luis, Sonora, to the basin of the Mimbres, Chihuahua. Northward, it penetrates the Transition Zone on the Colorado Plateau; and southward it assumes a darker phase in the Yaqui Basin.

Description of type.—In winter pelage; taken October 23. Similar to *L. arizonæ* (typica) but larger, more reddish, and darker. Pelage long, dense, and rather course; ears and feet well coated; above grayish drab, tinged with cinnamon, and thickly lined with black-pointed hairs on the back; sides paler, drab-gray; rump clear iron-gray; nape and outer surface of limbs, dull cinnamon; ears pale grayish on concave surface, drab mixed with gray and black on convex surface, and black at apex; under parts white, except the chest which is light clay-color.

Type.—No. $\frac{18122}{25000}$, U.S.N.M. Adult male, collected at Calabasas, Arizona, October 23, 1889, by Dr. Leonhard Stejneger. Original number, 3053.

LEPUS ARIZONÆ MINOR, new subspecies.

LESSER DESERT COTTONTAIL.

Geographic distribution.—This rabbit ranges from the plains of Colorado southward to the Rio Grande and westward to the elevated central tract, where it intergrades with *L. arizonæ major* in the pass between the southern end of the Rocky Mountains and northern extremity of the Sierra Madré.

Description (based on the type, in winter pelage).—Coat long, dense, and silky. On the back it is gray at base for a little more than half its length, then ringed successively with brown, black, and Naples yellow, pointed with black. Ears and feet well clothed. Upper surface of body yellowish brown, of a shade closely resembling Naples yellow, thickly lined with black, changing to yellowish gray on the sides, with a rather distinct line of buff separating the grayish sides from the white underparts; rump grayish white, lined with black; head pale gray, tinged slightly with yellowish brown on the cheeks and more deeply so on the crown; whiskers black; ear with convex surface grayish white posteriorly, gray slightly mixed with yellowish brown and black anteriorly, fringed with white on basal two-thirds of anterior edge, tipped with black, and coated with grayish white on concave surface, where there is an obsolete patch of dusky parallel to the posterior edge; nape light cinnamon; anterior face of fore limbs ochraceous-cinnamon; outer aspect of leg wood brown; hind feet white above, cinna-

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mon below; tail white, with a broad dorsal stripe composed of dusky hairs tipped with yellow-brown and gray; chest patch yellowish gray; residue of under parts pure white, with the exception of the two small colored patches usually present in rabbits, at the sides of the abdomen in front of the hind limbs, which patches are pale cinnamon.

Dimensions.—Average measurements of 14 adult males: Total length, 345 mm.; tail vertebræ, 50.2; ear from crown, 81.2; ear from notch, 65.8; length of hind foot, 83.4; length of head (nose to occiput), 70.9. Average of 16 adult females: Total length, 360 mm.; tail vertebræ, 52.8; ear from crown, 80; ear from notch, 64.3; hind foot, 83.7; head, 70.5.

Type.—No. $\frac{20104}{37084}$, U.S.N.M. (Coll. International Boundary Commission). Adult male, from El Paso, Texas. Collected February 6, 1892, by Mearns and Holzner. (Original number, 1418.)

General remarks.—This small, short-eared, pallid race of the *Lepus arizonæ* has been hitherto confused with *L. s. bachmani* and *L. s. nuttalli*. Quite recently,[1] however, Dr. J. A. Allen correctly referred a specimen to the species *L. arizonæ*. Comparing a series of specimens of this race from the type locality (El Paso, Texas) with a series of *L. arizonæ major* taken in central Arizona during the same month (February), the latter are seen to be darker and browner, as well as larger, with relatively larger ears.

The subspecies *minor* also differs from *L. arizonæ* (typica) in having the rostral portion of the skull more elongated, the mandible considerably higher and stouter, and the audital bullæ larger.

LEPUS MERRIAMI, Mearns.

RIO GRANDE JACKRABBIT.

Lepus texianus, AUDUBON and BACHMAN, N. Am. Quad., III, 1853, p. 156, pl. CXXXIII (Texas).

Lepus callotis, BAIRD, U. S. and Mex. Bd. Surv., 1859, pp. 45, 46 (in part; as to Nos. 134, 252, 299, and 300).—BAIRD, Mam. N. Am., 1857, p. 590 (in part; as to Nos. 299, 134, and 252).—ALLEN, N. Am. Rodentia, 1877, p. 350 ("Var. *callotis*;" in part).

Lepus merriami, MEARNS, Proc. U. S. Nat. Mus., XVIII, 1896, No. 1103, advance sheet, May 25, 1896, p. 2.

Similar to *Lepus callotis* of Mexico, but with shorter ears, which are tipped with black instead of white; with upper surface of body inclining to grayish fawn color rather than ochraceous buff. I have already briefly described this species, on a page of this volume, but think it desirable, in the present connection, to give a fuller description of it.

Geographic distribution.—The range of *Lepus merriami* extends along the lower Gulf coast of Texas to the mouth of the Rio Grande, and up that stream as far as the mouth of the Devil's River, near which point—about Del Rio—the writer found it extremely abundant.

Description of type.—Above grayish fawn color, mixed with black; underfur whitish; nape, and base and tip of ears, posteriorly, jet black;

[1] Bull. Am. Mus. Nat. Hist., New York, V, p. 28, 1893.

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black nape patch divided by an indistinct stripe composed of brownish gray-tipped hairs; ears with their convex surface, anteriorly, brownish gray mixed with black, white posteriorly, with a cream-colored interspace; inner surfaces of ears scantily coated with short hairs, which are white except on the middle portion of the posterior border, where they are blackish, forming an elongated dusky spot; ear fringes of anterior border clayey white, of tip black, of posterior border white; upper side of tail, and median area of rump, black; outer surface of legs, haunches, and side of rump grayish white, thickly lined with black hairs; gular area clay color; residue of under parts, including inner surfaces of limbs, pure white, except the usually stained patches at sides of abdomen in front of thighs, which in this species are cream buff. This female contained three fetuses, and had molted on the head, neck, and anterior half of the ventral surface before the date of its capture (April 6).

The specimen above described is essentially like numerous others which I have examined in the collections of the United States National and American museums from Indianola, Rockport, Brownsville, and other points in southeastern Texas.

An adult male (No. $\frac{7}{8}\frac{2}{8}\frac{7}{4}\frac{9}{}$, American Museum Coll.), taken at Rockport, Texas, September 18, 1893, by Mr. H. P. Attwater, is in summer pelage. The pelage is short and rigid. The upper parts are drab gray, mixed with black; nape black, with a faint longitudinal band of grayish posteriorly. The ears are very short-haired; convex surface white posteriorly, black apically, and finely mixed yellowish brown, gray, and black anteriorly; fringe on anterior edge yellowish brown, on posterior edge white; concave surface sparsely clothed with whitish and yellowish hairs, with a broad blackish area along the posterior border. The gular patch is wood brown mixed with grayish white; under side of tail smoky gray, slightly mixed with long grayish white and reddish brown hairs; residue of under parts white.

Description of young.—A small female (No. 2302, Coll. International Boundary Commission), about the size of a *Neotoma*, was taken from a marsh hawk (*Circus hudsonius*), at Fort Clark, Tex., February 25, 1893, by the author. It is coated above with plumbeous, brownish-pointed underfur, a median coat of banded hairs, and a sparse outside coating of extremely long, white-tipped, coarse hairs. The nape is sooty black. The general coloring is grayer than adults, and more mixed with black on the haunches and rump, and with darker underfur. A two-thirds grown male (No. $\frac{7}{8}\frac{2}{8}\frac{8}{8}\frac{3}{}$, Amer. Mus. Nat. Hist.), taken at Rockport, Texas, by Mr. H. P. Attwater, November 8, 1893, is in winter dress, except as to the middle of the back, and has a richer, more brownish coloring than any other examined. The ears are quite heavily coated on their concave surface, where they are decidedly ochraceous toward the apex and along the posterior border. The nape and base of ears, posteriorly, are black.

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Dimensions.—Total length, 570 mm; tail vertebræ, 75; ear from crown, 142; ear from notch, 118; length of hind foot, 123; length of head (nose to occiput), 105.

Cranial and dental characters.—The skull, though broad and high, is much less massive than those of *Lepus callotis* and *Lepus gaillardi*. The supraorbital processes of the frontal are less elevated and expanded, and the postorbital process incloses a long and narrow, instead of a broadly oval, foramen. The nasal bones are long, longitudinally convex, and very broad. The rostrum and brain case are of average dimensions. The dental armature is much weaker than in *L. callotis*, and quite similar to that of *L. gaillardi*.

Type.—No. 2317, Coll. International Boundary Commission. Adult female, from Fort Clark, Kinney County, Texas. Collected April 6, 1893, by Dr. Edgar A. Mearns.

General remarks.—This is the common "jackrabbit" of the Rio Grande. It has been described by Audubon and Bachman, Baird, Allen, and other writers, under the preoccupied names of *L. callotis* and *L. texianus*, with which species it has been confounded.

LEPUS GAILLARDI, new species.

GAILLARD'S JACKRABBIT.

Similar to *Lepus callotis*, but smaller, paler, more yellowish, with relatively shorter ears, and lacking the black nape patch.

Geographic distribution.—Gaillard's jack rabbit was found only on the east and west forks of the Playas Valley, bordering the San Luis Mountains on the east side.

Description of type.—Above pale ochraceous-cinnamon, mixed with black; under side of tail white, its upper surface black, many of the hairs being pointed with whitish; median black line of rump obsolete, but indicated by a (mostly concealed) line of sooty, brownish, white-tipped hairs; sides pure white; rump and thighs white, lined with a few black hairs, the former scarcely divided by a median dusky stripe; limbs white, stained with buff on their outer surfaces; gular patch buff, becoming more ochraceous on front of shoulders and sides of neck; head cream buff, mixed with black, with a whitish area on the side involving the eye; under parts white, with scarcely a trace of the colored patches usually present in front of thighs; ears scantily coated with short hairs; their concave surfaces almost bare, with the usual dusky spot along the posterior border; convex surfaces yellowish brown, mixed with black anteriorly, white posteriorly and at apex; long fringes of anterior edge of ear ochraceous buff, except subapically, where, as in *L. callotis*, there is a tuft of black; fringes of tip and posterior edge white; nape ochraceous buff. This specimen is in mixed coat. Molting has commenced in front and proceeded backward from the nose to the shoulders, and in the median line above to a point behind the middle of the back; there are also scattered patches on

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the sides and posterior portion of the back where the winter hair has fallen out en masse and is being replaced. The ventral surface is still covered with dense, long hair. The difference between the coloring of the winter and summer coats is slight.

Another specimen (No. $\frac{205}{35}\frac{27}{709}$, U.S.N.M.), an adult female containing three small fetuses, taken at the same locality June 16, 1892, is quite similar to the type in coloring, but has acquired the short summer coating on the whole ventral surface, though the change has not progressed as far on the dorsum, shedding having taken place only on the head and nape, a few scattered patches anteriorly, and over a large area of the posterior border of the blanketed portion of the back, and in the median area of the rump, to the tail.

Another adult female (No. $\frac{205}{35}\frac{22}{689}$, U.S.N.M.), taken at the same place June 29, 1892, has only shed the winter hair on the chest and anterior portion of abdomen, on the nose, and a few insignificant spots scattered over the upper surface. It is therefore in nearly complete winter dress. Though faded, the coloring is quite similar to the others. In these three the feet are remarkably shorter-haired, all of the claws being exposed. In comparison with the *texianus* group, the coat is short and coarse.

Description of young.—Two young females (Nos. $\frac{205}{35}\frac{30}{706}$ and $\frac{205}{35}\frac{31}{725}$, U.S.N.M.), from the same locality, June 16 and 17, 1892, are still in the soft, woolly coat of early life, except on the front of the head and anterior portion of the middle of the back, where the coarser coating has recently been acquired. This new pelage is vinaceous buff, that of the rest of the upper surface of the body varying from cream buff to cinnamon in different parts. The crown of the head is cinnamon; its sides clayey buff, except the orbital stripe, which is cream buff, and the gular area buff. The upper side of the tail is black, considerably grizzled, and mixed with yellowish white, and the central stripe of the rump is but faintly indicated. These two specimens, and an older one (No. 58914, U.S.N.M.), taken September 15, 1893, exhibit a very interesting character of this species, which I have deferred mentioning until now on account of the unsatisfactory condition of the pelage of the parts in the adults above described, in which the sides have a more or less patchy mixture of the winter and summer coats, tending to obscure the pattern. This character consists of a light stripe of cream buff extending along the anterior two-thirds of the body, above and parallel to the lower edge of the dark area of the back, spreading out anteriorly and involving the shoulder. These stripes are analogous to the shoulder stripes of *Spermophilus beecheyi;* and, their presence having been once determined in the present species, it is possible to discover traces of them in several other hares of this group. The importance of this mark consists in its indication of the common ancestry of the jackrabbits and cottontails.

Dimensions.—Measurements of one adult male: Total length, 530 mm.; tail vertebræ, 77; ear from crown, 146; ear from notch, 123; length

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of hind foot, 131; length of head (nose to occiput), 104. Average measurements of two adult females: Total length, 567 mm.; tail vertebræ, 86; ear from crown, 148; ear from notch, 127; hind foot, 135; head, 106.5.

Cranial and dental characters.—The skull of this species is high and rather wide. The supraorbital process of the frontal bone is elevated and massive. The nasal bones are long and very wide, especially behind. The rostral portion of the skull is of medium length, the brain case of average capacity, and the teeth of the usual size.

Type.—No. $\frac{20525}{35714}$, U.S.N.M. (Coll. International Boundary Commission). Adult male, from the west fork of the Playas Valley near monument No. 63, Mexican boundary line. Collected June 17, 1892, by Edgar A. Mearns and Frank X. Holzner.

General remarks.—This species scarcely requires comparison with any other. It bears a superficial resemblance to *L. alleni*, from which its diminutive size at once serves to distinguish it.

LEPUS TEXIANUS GRISEUS, new subspecies.

EASTERN DESERT JACKRABBIT.

Lepus callotis, BAIRD, Mam. N. Am., 1857, p. 590 (in part; as to No. 301?); U. S. and Mex. Bound. Survey, II, II, 1859, p. 46 (in part; as to No. 135, Eagle Pass, Tex.).—ALLEN, Mon. N. Am. Rodentia, 1877, p. 355 (in part only).

Geographic distribution.—This species inhabits the region of the upper Rio Grande, from Maverick and Kinney Counties, in Texas, to Grant County, New Mexico, ranging southward in Coahuila and Chihuahua, Mexico. Toward the Sierra Madré and other mountain chains to the northward, which form the backbone of the continent, this race gradually merges into the *texianus* type of this species.

Description of adult in winter coat.—Size considerably smaller than that of *Lepus texianus* or *L. melanotis*, about equal to *L. californicus*. Length, measured from nose to end of vertebræ of tail, 560 mm.; tail vertebræ 75; height of ear above crown, 138; length of hind foot, 122. Color above brownish gray; pelage thickly lined with long, black-tipped hairs, which are most numerous in the median area of the back; color of rump and haunches changing abruptly to clear grayish, because the brownish staining of the back is wanting. On the back, which has a mottled appearance, the underfur is gray at base for three-fifths of its length, then ringed with light brown, and pointed with black. The coarse, long hairs are white at base, ringed with black in the middle, subterminally ringed with pale drab gray, and pointed with black. Inspection of the parted coat, therefore, shows it to be smoke gray at base, then banded successively with pale brown, black, and drab gray, pointed with black. On the sides of the rump the underfur is pale gray at base and tip, white in the middle. The long coat on this part is composed of two kinds of hair, a dense growth of short hairs which are white to the base, banded and pointed with black, and a sparse growth of very long black hairs, tipped with white. Many of

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these long, black, white-tipped hairs are scattered along the sides of the body. Sides gray, slightly lined with black, and barely tinged with yellowish brown. Ears with anterior fringes brownish white, posterior fringes pure white, edges of tip black; their convex surfaces brownish gray anteriorly, white posteriorly, tipped with black for about 30 mm., the black cut off from most of the anterior border by an upward extension of the gray. Nape grayish white, with an indistinct, median, clay-colored band. Chin and area surrounding orbits, whitish; eyelids black. Whiskers black and white, mostly black, tipped with white. Crown, brownish gray, mixed with black. Sides of head and neck faintly stained with yellowish brown. Gular patch grayish clay color; patches in front of thighs faintly tinged with the same; residue of under parts, and inner surface of limbs, pure white. Tail gray, tinged with brownish below, jet black above, the black extending forward on the rump to a point opposite the anterior border of the sacrum, thus dividing the grayish white area of the posterior parts. Outer surface of limbs gray, slightly tinged with clay color; pads broccali brown.

Description of summer coat based on type specimen.—Coat shorter, coarser, and somewhat paler than in winter. It retains the mottled appearance above, and the sides, haunches, and rump are still grayish white, this latter feature serving to distinguish it from the races of *Lepus texianus* found west of the Rocky Mountains.

Dimensions.—Average measurements of 13 adult males: Total length, 559.2 mm.; tail vertebræ, 91.5; ear from crown, 152.8; ear from notch, 130.2; length of hind foot, 127; length of head (nose to occiput), 105.1. Average of 8 adult females: Total length, 582.5 mm.; tail vertebræ, 97; ear from crown, 158.5; ear from notch, 129; hind foot, 129.9; head, 105.5.

Variations.—The materials before me indicate that this race reaches its extreme differentiation in southwestern Texas and the adjacent States of Mexico. Further north and east it may be expected to intergrade with *L. melanotis*, as it certainly does with *L. texianus* in the western parts of New Mexico and Chihuahua. As we proceeded westward from the Rio Grande, along the boundary line, the characters of this race were very constant until the hilly country west of the Mimbres Valley was reached. From this point to the San Luis Mountains the ears were gradually lengthened, the whiteness of the rump and haunches became obscured by a backward extension of the brownish color of the back, which also deepened on the shoulders and flanks. In the San Luis Mountains of Chihuahua, north of the Sierra Madré, and the Animas range, which is an extension of the same range, into the United States, a large form of this hare was found which is practically identical with the *Lepus texianus*.

Cranial and dental characters.—The cranium is rather wide. Its height varies with the locality—eastern specimens averaging high and western low. The supraorbitals are straight-edged, narrow, and much elevated. Eastern specimens have the nasal bones exceedingly long

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and decurved, those of western examples being shorter and straighter; the nasals of eastern specimens are also the widest. The mandible is higher and the whole skull heavier in Texan specimens than in those from the southern border of New Mexico. In dentition this species does not differ materially from the true *L. texianus*.

Type.—No. $\frac{21068}{36108}$, U.S.N.M. (Coll. International Boundary Commission). Adult female, from Fort Hancock, El Paso County, Texas. Collected by Dr. Mearns, June 22, 1893. (Original number, 2353.)

LEPUS TEXIANUS DESERTICOLA, new subspecies.

WESTERN DESERT JACKRABBIT.

Lepus californicus, BAIRD, U. S. and Mex. Bound. Survey, 1859, p. 47 (lower Colorado River of California.—COOPER, Am. Nat., III, 1869, p. 470 (Colorado Valley).—ALLEN, Mon. N. Am. Rodentia, 1877, p. 358 (in part; as to No. 1327, etc.).

Geographic distribution.—This is a pallid race, from the desert region between the Sonoyta Valley, of Arizona and Sonora, and the Coast Range Mountains, of California and Lower California. On the Mexican boundary line it occupies the whole of the Tulé, Tinajas, Yuma, and Colorado deserts.

Description of type.—About the size of *Lepus californicus*, with larger ears. Above clay color, mixed with gray and black; sides and gular patch a little more ochraceous than in *Lepus californicus;* under parts tinged with ochraceous buff; ears scantily clothed, of the usual pattern, pale drab and white, with black at the apex posteriorly. This specimen is in winter coat, but has molted on the front of the head, where the new coat is seen to be no darker than the old.

Description of young.—No. 60912, U.S.N.M. (Coll. International Boundary Commission). A half-grown female, taken with the type, of which it was, perhaps, the progeny. It is still in the woolly coat without much overhair. Color above drab gray; sides and gular patch slightly more yellowish; rest of under parts yellowish white.

Variations.—Specimens from the deserts east of the Colorado River are larger, with relatively longer ears, and have the upper surface more mottled. On the Mexican boundary, intergradation with *L. t. eremicus* takes place in the region between the Tulé Mountains and the Sonoyta River. In tracing it westward it is observed to gradually take on some of the characters of *Lepus californicus*. The pelage becomes shorter, coarser, and plainer, losing the variegated or blotched appearance on the back; the size is decreased; and the under parts are suffused with yellowish brown. At the eastern base of the Coast Range Mountains the two species meet, and possibly their ranges slightly overlap; but, though the phase of *Lepus californicus* found in the Coast Range Mountains likewise shows some variations from the phase of the coast which are in the direction of the characters of *L. texianus*, the two species appear to be distinct. This fact warns us against the assumption that

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L. melanotis and *L. t. griseus* of the Texan region are geographical races of a common species, in the absence of positive proof of their intergradation.

Dimensions.—Average measurements of 2 adult males: Total length, 560 mm; tail vertebræ, 110; ear from crown, 158; length of hind foot, 125. Average of 3 adult females: Total length, 571 mm; tail vertebræ, 109; ear from crown, 171; ear from notch, 139; hind foot, 130.

Cranial and dental characters.—The skull of this form, especially in specimens from west of the Colorado River, shows a decided approach to the characters of *Lepus californicus*. Like that species, it is weak and fragile, and armed with a light dental apparatus. It is extremely low and narrow, with light supraorbitals, and short and narrow nasals. The brain case is narrow, however, while that of *L. californicus* has greater lateral expansion than usual. East of the Yuma Desert, the skull of this subspecies rapidly acquires the conformation of *L. t. eremicus*.

Type.—No. $\frac{8\,3\,7\,8}{6\,6\,4\,2}$, Am. Mus. Nat. Hist. Adult female, from the western edge of the Colorado Desert, at the base of the Coast Range Mountains, in San Diego County, California. Collected by Mr. Frank X. Holzner, May 7, 1894.

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NOTE ON PLECTROPLITES AND HYPOPLECTRODES, GENERA OF SERRANOID FISHES.

By THEODORE GILL, LL.D.

Mr. BOULENGER, in the first volume of his excellent Catalogue of the Perciform Fishes, has accepted two later names for genera on account of imperfect data respecting earlier ones: these are *Ctenolates* instead of *Plectroplites*, and *Gilbertia* in place of *Hypoplectrodes*. It is not surprising, for the author himself had even forgotten one—*Hypoplectrodes*.

I.

The name *Ctenolates* of Günther (1871) was adopted by Mr. Boulenger, and as a synonym was noted "*Plectroplites*, Gill, Proc. Ac. Philad., 1862, p. 236 (no definition); Bleek. Arch. Néerl. xi, 1876, p. 267."

It is true that at the place cited by Mr. Boulenger "no definition" was given, but one was supplied later in the following terms:

> The *Datnia*? *ambigua* of Richardson, which has been referred by Günther to the genus *Dules*, differs from *Moronopsis*[1] by the shorter convex anal fin, the large second anal spine, the small eyes, and the entire physiognomy. It may be called *Plectroplites ambiguus*.

The characters thus positively given and contrasted with those of *Kuhlia* or *Moronopsis* are sufficient to differentiate and define the genus, although the author, like Günther and all others, was unaware of the trenchant anatomical characters further differentiating the genus from *Kuhlia*. The synonymy of the genus should be amended as follows:

Genus PLECTROPLITES.

Plectroplites, GILL, Proc. Acad. Nat. Sci. Phila. 1862, p. 236 (with typonym only); 1863, p. 286 (defined).
Ctenolates, GÜNTHER, Proc. Zool. Soc. 1871, p. 320.
Datnia? sp. RICHARDSON.
Dules sp. GÜNTHER (1859) et al.

The *P. ambiguus* is still the only species known.

[1] *Moronopsis* had been previously named by Gill *Kuhlia*, and the latter name has been adopted by Jordan and Boulenger.

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II.

The name *Gilbertia* of Jordan and Eigenmann was adopted by Mr. Boulenger[1] in place of *Hypoplectrodes*, because the latter was supposed to have "no definition." On the page referred to by Mr. Boulenger, indeed, no definition was given, but later (in 1871) Professor Poey, to whom I had indicated the characters in response to an inquiry for them, gave them in a memoir entitled "Genres des Poissons de la Faune de Cuba appartenant à la Famille *Percidæ*, avec une Note d'introduction par J. Carson Brevoort."[2] Prof. Poey's diagnosis was as follows:

Le genre *Hypoplectrodes* a été proposé par Mr. Gill, Proc. Acad. Phil., 1862, p. 236, pour le *Pl. nigro-rubrum*, C. et V. Il est plus allongé que le *Pl. serratum;* les dentelures du bord montant du préopercule sont plus fines; il n'y a au bord inférieur que deux pointes dirigées en avant, dont l'une à l'angle. D. 10, 17; A. 3, 8.

I have to confess that I myself had forgotten having named this genus, or at least failed to connect with it the *Plectropoma huntii* of Hector of New Zealand, and consequently adopted the name *Gilbertia* of Jordan and Eigenmann who had overlooked the previous proposition of the genus by Gill and Poey.

The facts of the case, then, are expressible in the following synonymy:

Genus HYPOPLECTRODES.

Hypoplectrodes, GILL, Proc. Acad. Nat. Sci. Phila. 1862, p. 236 (with typonym only) (1862).—POEY, Ann. New York Lyc. Nat. Hist., X, p. 45, 1871 (defined).
Gilbertia, JORDAN & EIGENMANN, Bull. U. S. Fish Comm., VIII, p. 346, 1890.

The species of *Hypoplectrodes*, according to Mr. Boulenger's[3] views, are four in number, viz:

1. H. semicinctus=Plectropoma semicinctum CV.=P. huntii, Hector. South Australia, New Zealand, Chile.

2. H. annulatus=Plectropoma annulatum, Günther. South Australia.

3. H. nigroruber. South Australia.

4. H. (?) armatus=Serranus armatus, Castelnau. Australia (Swan River).

It may be added that the name *Gilbertia* was also given in 1891[4] by Lord Walsingham to a genus of pterophoroid lepidopters.

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[1] Vol. I, p. 306.
[2] Annals of the Lyceum of Natural History of New York, X, pp. 27–79.
[3] Vol. I, pp. 306–309.
[4] Ent. Monthly Mag. (2), II, p. 259.

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CATALOGUE OF A COLLECTION OF BIRDS MADE BY DOCTOR W. L. ABBOTT IN EASTERN TURKESTAN, THE THIAN-SHAN MOUNTAINS, AND TAGDUMBASH PAMIR, CENTRAL ASIA, WITH NOTES ON SOME OF THE SPECIES.

By CHARLES W. RICHMOND,

Assistant Curator of the Department of Birds.

THE present paper is based on a collection of birds made by Dr. Abbott in the course of his travels through Eastern Turkestan, the Thian-Shan Mountains, and in the Tagdumbash Pamir. This collection, numbering 210 finely prepared specimens and representing 98 species, has been presented to the National Museum by Dr. Abbott, with characteristic liberality, and forms an important addition to our meager representation of Central Asian birds. This last contribution of Dr. Abbott's is of the same high order as the preceding ones, the specimens showing a neatness of preparation and minute detail of data not often seen in collections formed in remote parts and under difficulties.

It seems desirable in this case, as in the catalogue of the Kashmir collection, to present a complete list of the specimens with their accompanying data, and, for the same reason expressed in that catalogue, the classification employed is that used in Dr. Sharpe's report on the birds of the "Second Yarkand Mission."

Dr. Abbott made a short excursion from Leh, Ladak, to Suget, Eastern Turkestan, in the early part of July, 1893, which was followed shortly by another and much more extended journey of many months, during which the following localities were visited: Starting from Suget late in July, Karakash River, Killian Pass, Killian, Bora, Kargallik, and Yarkand were visited during the month of August, and Kashgar early in September. The Thian-Shan Mountains were then reached, and the remainder of September, the whole month of October, and a few days of November were spent there. Returning, the valley of the Aksu, Ushturfan, Aksu, Matan, and the Kashgar River were visited in November, and in the following month and in January, 1894, some time was spent at Pishak Sindi, and on the Yarkand River. The country east of Maralbashi and Kokchall was visited in February, and Kashgar

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River and the place of that name were revisited in March. The Gez defile was passed on the last day of March, on the road to Sarikol, which place was reached on the 3d of April. Some days were passed here, after which a trip was made to the Tagdumbash Pamir, lasting until late in June. Returning by way of the Tangitar defile and Teret Pass, some time was spent in the mountains above Eggis Yar, and Kukiar was finally reached late in July. Some collecting was prosecuted on the road and at Killian in August on the way out of the country.

The Willow Warblers were submitted to W. E. Brooks together with those contained in the Kashmir collection, and he has very kindly corrected or verified my identifications of the same.

In the preparation of the present article I have not had access to Dr. Menzbier's "Ornithologie du Turkestan."

Family FALCONIDÆ.

1. CIRCUS CYANEUS (Linnæus).

Female, adult, The Syrt, Thian-Shan Mountains, November 1, 1893; 6,000 feet. "Bill black, cere pale green; irides brownish yellow; feet yellow; claws black."

Male, adult, Aksu, Eastern Turkestan, November 17, 1893. "Feet yellow; irides orange yellow; length, 18 inches."

2. CIRCUS ÆRUGINOSUS (Linnæus).

Female, immature, Thian-Shan Mountains, north of Kashgar, September 12, 1893; 7,000 feet. "Bill black, cere greenish; feet yellow, claws black; length, 21 inches. Extremely emaciated."

This specimen is without any buffy markings on forehead, throat, or breast, which are dark chocolate brown instead. The specimen may be described as follows: Nape and posterior part of crown deep buff, the feathers with rather narrow dark brown centers; no other trace of buff on head, neck, or breast, except slight traces of buff feathers on forehead at base of culmen; wings, back (rump somewhat duller), scapulars, and tail (above) uniform dark brown, with bronzy reflections, the tail narrowly tipped with deep buff; upper tail-coverts paler brown, the feathers with deep buffy tips; outer tail feathers fulvous at basal third of both webs, where finely mottled with dark brown; inner web of basal half of primaries similar; under parts uniform chocolate brown, lighter on abdomen and flanks, where the feathers are obsoletely tipped with buffy brown; under tail-coverts dark like throat and breast, with buffy tips to the feathers; middle and greater wing-coverts with narrow and almost obsolete rusty edgings; primaries and secondaries with light buff tips; some of the tertiaries with narrow rusty tips. Wing, 15.25 inches; tail, 8.85; tarsus, 3.65; culmen, 1.35.

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3. CIRCUS MACROURUS (Gmelin).

Female, immature, Thian-Shan Mountains, north of Kashgar, September 11, 1893; 7,000 feet. "Irides yellowish gray; length, 18½ inches."

Immature, Thian-Shan Mountains, north of Kashgar, September 11, 1893; 7,000 feet. "Feet yellow, claws black; length, 17½ inches."

4. ARCHIBUTEO LAGOPUS (Gmelin).

Female, adult, jungles on Yarkand River, east of Maralbashi, Eastern Turkestan, January 8, 1894. "Feet pale greenish yellow, claws black; bill black, horn blue at base of lower mandible; cere pale green; irides brownish gray; length, 23¾ inches."

5. GYPAËTUS BARBATUS (Linnæus).

Adult, Tagdumbash Pamir, April, 1894. Skull only.

6. AQUILA CHRYSAËTOS (Linnæus).

Female, immature, Tagdumbash Pamir, April 29, 1894; 13,500 feet. "Length, 38 inches; expanse, 91 inches; weight, 10½ pounds. Shot by D. T. Hanbury, esq."

7. FALCO REGULUS, Pallas.

Male, immature, Pishak Sindi, east of Maralbashi, Eastern Turkestan January 27, 1894. "Feet yellow, claws black; bill horn blue, black at tip; cere pale greenish; irides dark brown; length, 11¼ inches."

8. FALCO TINNUNCULUS, Linnæus.

Male, adult, Thian-Shan Mountains, north of Kashgar, September 10, 1893; 6,000 feet. "Length, 12¾ inches."

Male, adult, near Ushturfan, Eastern Turkestan, November 10, 1893; 6,000 feet. "Length, 13¼ inches."

Male, adult, Ushturfan, Eastern Turkestan, November 11, 1893. "Feet orange, claws black; irides dark brown; length, 14¼ inches."

Male, adult, Aksu, Eastern Turkestan, November 19, 1893. "Length, 13⅜ inches."

Male, adult, Matan, 40 miles south of Aksu, Eastern Turkestan, November 27, 1893. "Length, 13¼ inches."

Family CORVIDÆ.

9. CORVUS FRUGILEGUS, Linnæus.

Male, adult, Ushturfan, Eastern Turkestan, November 15, 1893. "Length, 19 inches."

Female, immature, Ushturfan, Eastern Turkestan, November 15, 1893. "Length, 17¼ inches."

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10. CORVUS CORAX, Linnæus.

Male, adult, Tagdumbash Pamir, May 14, 1894; 14,000 feet. "Length, 25 inches." Wing, 16.70 inches; tail, 10; tarsus, 2.75; culmen, 2.77.

11. CORVUS MONEDULA COLLARIS (Drummond).

Male, adult, Ushturfan, Eastern Turkestan, November 14, 1893. "Bill and feet black; irides white; length, 13¾ inches."

12. CORVUS SHARPII, Oates.

Female, adult, Thian-Shan Mountains, north of Kashgar, September, 1893; 9,000 feet. "Irides dark brown; length, 18⅜ inches."

13. CORVUS CORONE, Linnæus.

Male, adult, Yarkand, Eastern Turkestan, August 18, 1893; 4,000 feet. "Length, 20½ inches."

Male, adult, Ushturfan, Eastern Turkestan, November 11, 1893; 5,000 feet. "Length, 21½ inches."

Measurements of Corvus corone.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150239	Male ad.	Ushturfan, Eastern Turkestan.	Nov. 11	13.50	8.80	2.56	2.37
150240	Male ad.	Yarkand, Eastern Turkestan.	Aug. 18	13.20	8.75	2.35	2.20

14. PICA PICA LEUCONOTOS (Brehm.)

Male, adult, Kashgar, Eastern Turkestan, March 19, 1894. "Length, 20 inches."

Male, adult, Kashgar, Eastern Turkestan, March 19, 1894. "Length, 21½ inches."

15. GRACULUS GRACULUS (Linnæus).

Male, adult, Tagdumbash Pamir, April 25, 1894; 13,000 feet.

16. PYRRHOCORAX PYRRHOCORAX (Linnæus).

Male, adult, Sarikol, Eastern Turkestan, April 7, 1894; 10,400 feet.

17. PODOCES BIDDULPHI, Hume.

Male, adult, Matan, 40 miles south of Aksu, Eastern Turkestan, November 27, 1893. "Irides dark brown; length, 12½ inches."

Male, adult, Matan, Eastern Turkestan, November 27, 1893. "Bill and feet black; length, 11½ inches."

Female, adult, Matan, Eastern Turkestan, November 27, 1893. "Length, 12¼ inches."

Male, adult, jungle on Yarkand River, east of Maralbashi, Eastern Turkestan, January 30, 1894. "Length, 12¼ inches."

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Male, adult, jungle on Yarkand River, east of Maralbashi, January 30, 1894. "Length, 12 inches."

In the two last-mentioned specimens the ninth and tenth primaries are white, without black terminal markings; in others the ninth primary has a subterminal blackish spot, in one specimen occupying only the inner web, but in the others extending over both webs. The black shaft mark on the middle pair of tail feathers also varies to some extent, being almost restricted to the shaft in one specimen, and having a width of a tenth of an inch in another. In all of the specimens some of the central tail feathers are black on the inner web at their bases, the color being concealed by the tail-coverts.

Measurements of Podoces biddulphi.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150251	Male ad...	Matan, Eastern Turkestan.	Nov. 27, 1893	5.90	.....	1.91	1.97
150252	Male ad...	.....do	.....do	5.99	4.43	1.87	2.00
150253	Female ad.	.....do	.....do	5.67	4.10	1.82	1.97
150249	Male ad...	Yarkand River, Eastern Turkestan.	Jan. 30, 1894	5.91	4.10	1.83	1.78
150250	Male ad...	.....do	.....do	5.95	4.08	1.86	1.89

Family ORIOLIDÆ.

18. ORIOLUS KUNDOO, Sykes.

Male, adult, Yarkand, Eastern Turkestan, August 19, 1893. "Bill pale pinkish brown; feet dull leaden; irides dull carmine; length, 9⅞ inches."

Family STURNIDÆ.

19. STURNUS VULGARIS MENZBIERI (Sharpe).

Female, adult, Thian-Shan Mountains, north of Kashgar, October 29, 1893; 7,000 feet. "Length, 9 inches."

20. STURNUS PURPURASCENS PORPHYRONOTUS (Sharpe).

Female, adult, Kargallik, Eastern Turkestan, August 12, 1893. "Length, 9 inches." Two specimens.

Adult, Thian-Shan Mountains, north of Kashgar, October 29, 1893; 7,000 feet. "Length, 9 inches."

Family FRINGILLIDÆ.

21. ACANTHIS BREVIROSTRIS (Bonaparte).

Male, adult, Suget, Eastern Turkestan, July 13, 1893; 13,000 feet. "Feet blackish brown; bill horny white; length, 5½ inches."

Male, adult, near Suget, Eastern Turkestan, July 29, 1893; 13,000 feet. "Bill pale fleshy, with pink tinge; feet dark brown; length, 5⅝ inches."

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Female, adult, near Suget, Eastern Turkestan, July 29, 1893; 13,000 feet. "Bill fleshy white."

Female, adult, Little Kara Kul Lake, Sarikol, Eastern Turkestan, April 3, 1894; 12,000 feet. "Length, 5¼ inches."

Male, adult, Tagdumbash Pamir, June 13, 1894; 13,000 feet. "Length, 5¼ inches."

22. MONTIFRINGILLA ALPICOLA (Pallas).

Male, adult, Turugart Pass, Thian-Shan Mountains, September 20, 1893; 12,000 feet. "Bill orange, dark brown above; feet black; length, 7½ inches."

23. LEUCOSTICTE BRANDTI, Bonaparte.

Male, adult, Suget Pass, Eastern Turkestan (road from Leh to Yarkand), July, 1893; 16,000 feet. "Bill and feet black; length, 7 inches."

Male, adult, Tagdumbash Pamir, April 28, 1894; 13,000 feet.

24. RHODOSPIZA OBSOLETA (Lichtenstein).

Male, adult, Bora, Eastern Turkestan, August 11, 1893. "Feet pale fleshy brown; bill black; irides pale brown; length, 6½ inches."

Male, Ushturfan, Eastern Turkestan, November 15, 1893. "Bill black; length, 6¼ inches."

Male, adult, Ushturfan, Eastern Turkestan, November 15, 1893. "Bill horn yellow; length, 6¼ inches."

Male, adult, south of Aksu, Eastern Turkestan, November 23, 1893. "Length, 6⅜ inches."

Female, adult, south of Aksu, Eastern Turkestan, November 23, 1893. "Length, 6 inches."

25. BUCANETES MONGOLICUS (Swinhoe).

Male, adult, Thian-Shan Mountains, north of Kashgar, September 13, 1893; 9,000 feet. "Irides brown; feet orange; length, 5⅞ inches."

Female, adult, Thian-Shan Mountains, north of Kashgar, September 13, 1893; 9,000 feet. "Length, 5¾ inches."

Female, adult, Thian-Shan Mountains, north of Kashgar, September 13, 1893; 9,000 feet. "Bill dirty yellow, brownish above; length, 6 inches."

Female, adult, Thian-Shan Mountains, north of Kashgar, September 13, 1893; 9,000 feet. "Bill dirty yellow, brownish above; feet orange; length, 5¾ inches."

Male, adult, Thian-Shan Mountains, north of Kashgar, September 16, 1893; 9,000 feet. "Feet pale brown, claws black; length, 5⅞ inches."

26. PETRONIA PETRONIA (Linnæus).

Female, adult, Aksu, Eastern Turkestan, November 20, 1893. "Feet pale brownish flesh color; upper mandible dark horn brown, lower mandible yellowish; irides hair brown; length, 6½ inches."

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27. PASSER MONTANUS DILUTUS, new subspecies.

Type.—No. 150331, U.S.N.M., male, adult; Kashgar, Eastern Turkestan, March 21, 1894. Similar to *P. montanus*, but considerably paler everywhere; no gray across breast; shoulders pale cinnamon-rufous instead of chestnut; sides of body and under wing-coverts very pale buffy white; under side of primaries (or inner web) salmon buff. Wing, 2.83; tail, 2.23; tarsus, 0.71; culmen, 0.46 inches.

This appears to be a very good pale form of the Tree Sparrow. The specimen here described does not differ from the true *P. montanus* in the extent of black on the throat, but Dr. Sharpe in his treatment of that species in the British Museum "Catalogue of Birds" refers to a more restricted black throat patch in the pale race inhabiting Turkestan.

Male, adult, Kashgar, Eastern Turkestan, March 21, 1894.

Male, immature, Killian, Eastern Turkestan, August 9, 1893; 6,000 feet. "Bill horn brown; feet pale fleshy; length, 5⅞ inches."

Female, immature, Killian, Eastern Turkestan, August 10, 1893. "Bill black, gape yellow; feet pale flesh, with leaden tinge; length, 5⅞ inches."

Male, immature, Killian, Eastern Turkestan, August 10, 1893; 6,000 feet. "Upper mandible horn brown; lower mandible dusky yellow; irides dark brown; feet pale flesh; length, 6 inches."

28. PASSER AMMODENDRI, Gould.

Male, adult, junction of Aksu and Kashgar rivers, Eastern Turkestan, December 3, 1893. "Bill horn brown; irides brown; length, 6½ inches."

Female, adult, junction of Aksu and Kashgar rivers, Eastern Turkestan, December 3, 1893. "Feet pale fleshy brown; bill horn brown; length, 6½ inches."

Male, adult, Matan, 40 miles south of Aksu, Eastern Turkestan, November 27, 1893. "Length, 6¾ inches."

Passer ammodendri timidus (Prjevalsky) differs from the above in its slightly larger dimensions, paler brown on sides of head and nape, and grayer color generally. We have a fine example of this form from Ili, Siberia, which exhibits very well the differences between it and *P. ammodendri*.

29. CARPODACUS ERYTHRINUS (Pallas).

Female, adult, Thian-Shan Mountains, north of Kashgar, September 11, 1893; 7,000 feet.

Male, adult, near Kukiar, Eastern Turkestan, August 2, 1894; 6,000 feet.

Female, adult, Tagdumbash Pamir, June 13, 1894; 13,000 feet.

30. CARPODACUS SEVERTZOVI, Sharpe.

Male, adult, Little Kara Kul Lake, Sarikol, Eastern Turkestan, April 3, 1894; 12,000 feet.

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Male, adult, Gez defile, road to the Pamir, Eastern Turkestan, March 31, 1894. Two specimens.

Female, adult, Tagdumbash Pamir, June 11, 1894; 13,000 feet.

Male, immature, Kuen-Luen Mountains, Killian Pass, Eastern Turkestan, August 6, 1893; 10,000 feet. "Bill pale horn brown."

Male, immature, Kuen-Luen Mountains, Killian Pass, Eastern Turkestan, August 6, 1893; 10,000 feet. "Bill greenish yellow."

31. CARPODACUS RHODOCHLAMYS (Brandt).

Male, adult, Thian-Shan Mountains, below the Saribeli Pass, October 28, 1893; 9,000 feet.

Female, adult, Thian-Shan Mountains, below the Saribeli Pass, October 28, 1893; 9,000 feet.

Female, adult, Pishak Sindi, east of Maralbashi, Eastern Turkestan, January 27, 1894. "Bill dark horn brown, pale underneath; irides hair brown; feet dark fleshy brown."

Female, adult, junction of Aksu and Kashgar rivers, Eastern Turkestan, December 2, 1893.

32. CARPODACUS STOLICZKÆ (Hume.)

Male, adult, mountains above Eggis Yar, Eastern Turkestan, June 28, 1894; 7,000 feet.

33. PYRRHOSPIZA LONGIROSTRIS, Prjevalsky.

Female, adult, north side of Killian Pass, Kuen-Luen Mountains, Eastern Turkestan, August 5, 1893; 15,000 feet. "Upper mandible dark horn brown; lower mandible flesh color; irides light brown; feet blackish brown; length, 8⅛ inches."

Male, adult, Teret Pass, Eastern Turkestan, June 26, 1894; 13,300 feet.

Male, adult, Tagdumbash Pamir, May 21, 1894; 14,000 feet. "Bill brownish horn, paler beneath; length, 8 inches."

Female, adult, Tagdumbash Pamir, May 21, 1894; 14,000 feet.

Previous to the receipt of Dr. Abbott's specimens the National Museum possessed no skins of this rare bird, and it has been somewhat difficult to decide, from descriptions alone, to which of the described forms these specimens belong. On the whole, I think they come nearer *P. longirostris* of Prjevalsky, with whose description and plate they have been carefully compared. The dimensions appear to be greater than in the allied forms (see table of measurements), and the females sent by Dr. Abbott agree in general with Prjevalsky's diagnosis, but not so well with Sharpe's description of the female of *P. punicea*,[1] from which they differ in having the rump maize yellow, in decided contrast to the color of the back; the breast maize yellow, many of the feathers broadly tipped with glossy ocher yellow and centered with narrow

[1] Cat. Birds, Brit. Mus., XII, 1888, p. 432.

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blackish triangular spots; the upper tail-coverts similar in color to the back, not "like the rump," as set forth in Dr. Sharpe's description of *P. punicea*.

Dr. Abbott's care in determining the sex of his specimens, and his close attention to details in their preparation, renders it very improbable that the examples here regarded as females are immature males. According to Dr. Sharpe's description of *P. punicea* above cited, the young males differ from adult females "in having the rump yellow and in the strong shade of olive-yellow which pervades the throat and breast, while the foreneck and breast have large black triangular spots."

A male from Ladak, recorded in a former paper, and the male from Teret Pass have an isolated spot of crimson posterior to the superciliary stripe of that color.

The three described forms of *Pyrrhospiza* from the Himalayas and central Asia are probably specifically the same, but I prefer to keep the present one separate at present, pending further information on the geographical distribution of the forms, as birds dwelling at such high altitudes may exist in thoroughly isolated colonies, and under such conditions must, of course, be regarded as full species.

Measurements of Pyrrhospiza longirostris.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150313	Female ad.	Kuen-Luen Mountains.	Aug. 5, 1893	4.48	3.40	1.00	.67
150312	Male ad...	Teret Pass, Eastern Turkestan.	June 26, 1894	4.60	3.40	1.00	.63
150309	Male ad...	Tagdumbash Pamir ..	May 21, 1894	4.55	3.30	.99	.67
150310	Female ad.	.....do	.....do	4.42	3.17	.98	.65
		Average.....	.....	4.51	4.32	.99	.66

34. PYRRHULORHYNCHA PYRRHULOIDES (Pallas).

Female, adult, junction of Aksu and Kashgar rivers, Eastern Turkestan, November 29, 1893. "Bill dark horn brown, pale below; feet dark brown; length, 7 inches."

Female, adult, junction of Aksu and Kashgar rivers, Eastern Turkestan, December 2, 1893.

Male, immature, jungle on Kashgar River, 90 miles east of Maralbashi, Eastern Turkestan, December 5, 1893.

Male, adult, jungle east of Maralbashi, Eastern Turkestan, February 1, 1894. "Bill dark horn brown, pale beneath; feet fleshy brown; irides dark brown; length, $7\frac{3}{8}$ inches."

Female, adult, jungle east of Maralbashi, Eastern Turkestan, February 1, 1894. "Feet fleshy brown; length, $6\frac{7}{8}$ inches."

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35. EMBERIZA SCHŒNICLUS, Linnæus.

Male, adult, between Ushturfan and Aksu, Eastern Turkestan, November 16, 1893. "Feet dark fleshy brown; upper mandible black; lower mandible dark slaty; length, 6⅜ inches."

Male, adult, Aksu, Eastern Turkestan, November 19, 1893. Three specimens.

These birds belong to one of the pale forms of *E. schœniclus*, but I am unable to satisfactorily determine which, if any, of the names already given apply to this particular one.

36. EMBERIZA LUTEOLA, Sparrman.

Male, adult, Killian, Eastern Turkestan, August 10, 1893; 6,000 feet. "Feet pale fleshy brown; irides dark brown; upper mandible horn brown; lower mandible leaden; length, 7½ inches."

Male, adult, Killian, Eastern Turkestan, August 10, 1893; 6,000 feet. "Upper mandible horn brown; lower mandible leaden; feet pale fleshy brown; irides dark brown; length, 7 inches."

Female, immature, Killian, Eastern Turkestan, August 9, 1893; 6.000 feet. "Feet pale brownish flesh; length, 6½ inches."

37. EMBERIZA GODLEWSKII, Taczanowski.

Male, adult, Tangitar defile, Eastern Turkestan, June 25, 1894; 11,000 feet. "Length, 7⅛ inches."

38. EMBERIZA LEUCOCEPHALA (Gmelin).

Male, adult, Thian-Shan Mountains, north of Kashgar, October 11, 1893; 9,000 feet. "Feet pale fleshy brown; length, 7¼ inches."

Family ALAUDIDÆ.

39. OTOCORIS PENICILLATA DILUTA (Sharpe).

Male, immature, Turugart Pass, Thian-Shan Mountains, September 20, 1893; 12,000 feet. "Feet dark brown; length, 7½ inches."

Female, adult, Bulan Kul (on road to Sarikol), Eastern Turkestan, April 1, 1894. "Length, 7¼ inches."

Female, adult, Bulan Kul, Eastern Turkestan, April 1, 1894; 10,000 feet. "Length, 7⅛ inches."

Male, adult, Bulan Kul, Eastern Turkestan, April 2, 1894; 10,000 feet. "Length, 7¾ inches."

Male, adult, Tagdumbash Pamir, June 16, 1894; 12,000 feet. "Length, 7¼ inches. Eggs belonging to this species also sent."

40. OTOCORIS LONGIROSTRIS ELWESI (Blanford).

Male, adult, Suget Pass (on road from Leh to Yarkand), Eastern Turkestan, July 28, 1893; 16,000 feet. "Upper mandible black; lower mandible horny bluish white; feet dull black, soles pale; length, 7⅝ inches."

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41. CALANDRELLA TIBETANA, Brooks.

Female, adult, Tagdumbash Pamir, June 15, 1894; 12,000 feet. "Length, 6 inches. Nest and eggs of this specimen also sent."

Female, adult, Tagdumbash Pamir, June 17, 1894; 12,000 feet. "Length, 6 inches. Nest containing two eggs belonging to this specimen also sent."

Female, adult, Tagdumbash Pamir, June 18, 1894; 12,000 feet. "Length, 5⅞ inches. Eggs of this specimen also sent."

42. CALANDRELLA TIBETANA ACUTIROSTRIS (Hume).

Male, adult, Suget, Eastern Turkestan, July 30, 1893; 13,000 feet. "Bill dull yellow, black on culmen and tip; irides dark brown; feet pale brownish flesh; length, 6⅛ inches."

Female, young, Suget, Eastern Turkestan, July 30, 1893; 13,000 feet. "Bill dirty yellowish brown; feet pale yellowish flesh color; irides brown."

The above specimens are referred with some hesitation to this form. The adult possesses a very slender bill, and in this respect differs markedly from three birds taken in the Pamir, and recorded under the preceding species, and from three Ladak examples, but the pattern on the outer tail feather does not meet the requirements of *acutirostris* as laid down by Dr. Sharpe,[1] the white on the inner web being fully as extensive as shown in *C. tibetana*, and this is also the case in the young bird from the same locality.

43. ALAUDULA PISPOLETTA SEEBOHMI (Sharpe).

Female, adult, Thian-Shan Mountains, north of Kashgar, September 10, 1893; 6,000 feet. "Length, 6¼ inches."

Female, adult, Karatol, 35 miles south of Aksu, Eastern Turkestan, November 26, 1893.

The specimens here recorded appear to be referable to this form, but, having no specimens to compare them with, I am obliged to rely upon Dr. Sharpe's description, which is very brief and consists mostly of a comparison with other forms which I have not at hand. The measurements given by him are not referred to either sex, but may be those of the male, as my specimens are considerably smaller.

Measurements of Alaudula pispoletta seebohmi.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Culmen.	Tarsus.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150235	Female ad.	Thian-Shan Mountains.	Sept. 10, 1893	3.49	2.54	0.39	0.77
150236	Female ad.	Karatol, Eastern Turkestan.	Nov. 26, 1893	3.60	2.61	.41	.73

[1] Cat. Birds, Brit. Mus., XIII, p. 586.

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44. GALERIDA CRISTATA MAGNA (Hume).

Male, adult, Killian, Eastern Turkestan, August 9, 1893; 6,000 feet. "Bill horny flesh color; irides pale brown; feet pale fleshy yellow; length, 7⅞ inches."

Female, young, Killian, Eastern Turkestan, August 9, 1893; 6,000 feet. "Feet pale yellowish flesh color."

Family MOTACILLIDÆ.

45. MOTACILLA ALBA DUKHUNENSIS (Sykes).

Male, immature, Chakmak, Thian-Shan Mountains, September 14, 1893; 9,000 feet. "Bill and feet black; length, 7⅝ inches."

Male, immature, below Suiok Pass, Thian-Shan Mountains, September 28, 1893; 10,000 feet. "Bill and feet black; length, 8⅛ inches."

Male, adult, Tagdumbash Pamir, May 15, 1894; 14,000 feet. "Length, 8⅜ inches."

46. MOTACILLA PERSONATA, Gould.

Male, adult, Killian, Eastern Turkestan, August 9, 1893; 6,000 feet. "Bill and feet black."

47. BUDYTES CITREOLA (Pallas).

Male, adult, west of Kashgar, Eastern Turkestan, March 27, 1894. "Length, 7 inches."

48. ANTHUS TRIVIALIS (Linnæus).

Male, adult, Thian-Shan Mountains, north of Kashgar, September 11, 1893; 7,000 feet. "Length, 6½ inches."

Male, adult, Thian-Shan Mountains, north of Kashgar, September 16, 1893; 9,000 feet. "Bill black above, dirty yellow below; length, 6¾ inches."

Family PARIDÆ.

49. PARUS CYANUS, Pallas.

Male, adult, Aksai Valley, Ushturfan, Eastern Turkestan, November 10, 1893; 6,000 feet.

Male, adult, Ushturfan, Eastern Turkestan, November 15, 1893. "Length, 5¼ inches."

Male, adult, Ushturfan, Eastern Turkestan, November 15, 1893. "Length, 5¼ inches."

These specimens represent a subspecies of *P. cyanus*, differing from it in smaller bill, bluish tinge to top of head; uniform blue of back and rump, and rather less white on wing and tail markings.

Possibly the *P. cyanus tianschanicus* of Severtzoff, but I am at present unable to find a description of the latter.

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50. LEPTOPŒCILE SOPHIÆ, Severtzoff.

Female, adult, Thian-Shan Mountains, north of Kashgar, September 15, 1893; 9,000 feet. "Bill and feet black; irides red; length, 4⅜ inches."

51. PANURUS BIARMICUS SIBIRICUS (Bonaparte).

Male, adult, jungle on Yarkand River, near Maralbashi, Eastern Turkestan, December 23, 1893. "Length, 7 inches."

Male, adult, same locality and date. "Feet black; bill and irides saffron yellow; length, 6⅝ inches."

Male, adult, same locality and date. "Length, 6½ inches."

Female, adult, same locality and date. "Length, 6¼ inches."

Female, adult, same locality and date. "Bill and irides saffron yellow; feet black; length, 6⅛ inches."

Bonaparte's description of a pale form of *P. biarmicus* reputed to occur in Kamtchatka probably refers to the present bird, and his name *sibiricus* would then be eligible for this form, at any rate until some other pale form is discovered in Kamtchatka.

Family LANIIDÆ.

52. LANIUS HOMEYERI, Cabanis.

Female, adult, The Syrt, Thian-Shan Mountains, November 1, 1893; 6,000 feet. "Bill and feet black; base of lower mandible fleshy; length, 11¾ inches."

Male, adult, The Syrt, Thian-Shan Mountains, November 1, 1893; 6,000 feet. "Irides dark brown; length, 11⅞ inches."

Female, immature, Karatol, 30 miles south of Aksu, Eastern Turkestan, November 24, 1893. "Length, 10⅜ inches."

Female, immature, Pishak Sindi, Kashgar River, Eastern Turkestan, December 12, 1893. "Length, 10¼ inches."

53. LANIUS ISABELLINUS, Ehrenberg.

Male, immature, near Killian, Eastern Turkestan, August 10, 1893. "Feet dull black; upper mandible brown, lower mandible pale dirty yellow; irides dark brown; length, 7½ inches."

Female, immature, Kashgar, Eastern Turkestan, September 9, 1893.

Male, immature, Thian-Shan Mountains, north of Kashgar, September 11, 1893; 7,000 feet. "Length, 7½ inches."

Female, adult, Thian-Shan Mountains, north of Kashgar, September 13, 1893; 9,000 feet. "Feet black, soles whitish; upper mandible dark horn brown, lower mandible brownish flesh. Length, 7 inches; irides dark brown."

Family SYLVIIDÆ.

54. ACROCEPHALUS AGRICOLA (Jerdon).

Immature, below the Suiok Pass, Thian-Shan Mountains, September 28, 1893; 10,000 feet. "Upper mandible horn black; lower mandible pale flesh; feet pale brownish flesh; length, 5 inches."

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In regard to this specimen Mr. Brooks writes: "No. 150425 is *Acrocephalus agricola*. It has the small bastard primary of *Acrocephalus*. None of the *Hypolais* in faded plumage would show so red. I have, however, nothing to compare it with." Thanks to Mr. Brooks, we now have three other examples of this species, and the determination of the Abbott specimen is readily made. I was at first inclined to think it *H. obsoleta*, but the specimens sent by Mr. Brooks, with his identification, plainly show it to be *A. agricola*. The second primary equals the sixth; third and fourth are about equal and longest; the spurious primary extends about 0.05 inch beyond the primary coverts. Wing, 2.17 inches; tail, 1.90; tarsus, 0.83; culmen, 0.43.

55. PHYLLOPSEUSTES INDICUS (Jerdon).

Male, adult, Tagdumbash Pamir, June 13, 1894; 13,000 feet. "Length, 4¾ inches."

Female, adult, Tagdumbash Pamir, June 13, 1894; 13,000 feet. "Length, 5 inches."

The two specimens of this species do not differ from descriptions, except in the absence of any ochraceous or yellow wash on the rump, which is similar to the back in color. This is probably accounted for by the season of the year in which they were obtained.

56. PHYLLOPSEUSTES HUMII (Brooks).

Female, adult, near Suget, Eastern Turkestan, July 29, 1893. "Feet fleshy brown; upper mandible blackish brown; lower mandible dirty yellowish brown; length, 4⅛ inches." "What the bird fades to in the breeding season."—W. E. B.

Male, adult, Thian-Shan Mountains, north of Kashgar, September 15, 1893; 9,000 feet. "Bill brownish black, yellowish at base of lower mandible; feet black, soles white; irides dark brown; length, 8⅛ inches." "Good typical example in fresh autumnal plumage."—W. E. B.

Mr. Brooks has corrected me on the above specimens, and I am now satisfied that they are *P. humii*, as identified by him, instead of *P. superciliosus*, with which I had doubtfully classed them.

57. RHOPOPHILUS ALBOSUPERCILIARIS (Hume).

Male, adult, junction of Aksu with Kashgar rivers, Eastern Turkestan, November 29, 1893. "Bill black above, pale below; irides brown; feet pale brownish flesh color; length, 7⅝ inches."

Female, adult, Pishak Sindi, Kashgar River, Eastern Turkestan, December 12, 1893. "Length, 7 inches."

Male, adult, Pishak Sindi, Kashgar River, Eastern Turkestan, December 13, 1893. "Length, 7⅜ inches."

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Family TURDIDÆ.

58. PRATINCOLA MAURA (Pallas).

Female, adult, Thian-Shan Mountains, north of Kashgar, September 15, 1893; 9,000 feet. "Bill and feet black; length, 5¼ inches."

Male, immature, Tagdumbash Pamir, June 10, 1894; 13,000 feet. "Length, 5½ inches."

Female, adult, Tagdumbash Pamir, June 11, 1894; 13,000 feet. "Length, 5¼ inches. Eggs of this specimen also sent."

The immature male is in rather worn plumage, and is almost exactly similar in color to the adult female. It has the throat black with a slight admixture of pale buff feathers like those of the female; the ear-coverts are nearly uniform black; the white patch on sides of the neck and breast is almost entirely wanting; a few black feathers are present on the crown, while the forehead is largely black; there are also a very few black feathers on the back. The under wing-coverts, thighs, wings, breast (the fore breast is slightly brighter), and remainder of underparts are similar to those of the female; terminal half of lateral tail feathers similar to those of the female, basal half black as in the adult male.

These specimens are of the same form collected in Kashmir by Dr. Abbott, and recently recorded in a paper[1] on his Kashmir collection, which see.

59. SAXICOLA PLESCHANKA, Lepechin.

Female, adult, Thian-Shan Mountains, north of Kashgar, September 10, 1893; 6,000 feet. "Length, 6½ inches."

Male, adult, Thian-Shan Mountains, north of Kashgar, September 10, 1893; 6,000 feet. "Length, 6⅝ inches."

Male, adult, Thian-Shan Mountains, north of Kashgar, September 15, 1893; 9,000 feet. "Bill and feet black; length, 6½ inches."

These autumn birds from the Thian-Shan Mountains are so much larger than the summer birds collected in Kashmir by Dr. Abbott, and the black on the lateral rectrices is so restricted, that it is very difficult to reconcile the two lots to one form. I presume the present series represents true *S. pleschanka*.

Measurements of Saxicola pleschanka.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150382	Male ad.	Thian-Shan Mountains	Sept. 10	4.00	2.63	0.95	0.50
150384	Male ad.	do	Sept. 15	3.93	2.62	.95	.51
150383	Female ad.	do	Sept. 10	3.67	2.42	.89	.52

60. SAXICOLA ISABELLINA, Cretzschmar.

Male, adult, west of Kashgar, Eastern Turkestan, March 27, 1894. "Bill and feet black; length, 6⅞ inches."

[1] Proc. U. S. Nat. Mus., XVIII, 1895, p. 479.

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61. SAXICOLA MONTANA, Gould.

Young, Suget, Eastern Turkestan, July 30, 1893; 13,000 feet. "Bill and feet black; irides dark brown; length, 6¼ inches."

Female, adult, near Killian, Eastern Turkestan, August 8, 1893; 7,000 feet. "Bill and feet black; length, 6⅜ inches."

Female, adult, near Killian, Eastern Turkestan, August 8, 1893; 7,000 feet. "Bill and feet black; irides dark brown; length, 6⅜ inches."

Male, adult, Chung Terek, Thian-Shan Mountains, north of Kashgar, September 11, 1893; 7,000 feet. "Length, 6⅜ inches."

Male, adult, Tagdumbash Pamir, May 1, 1894; 13,500 feet.

Male, adult, Tagdumbash Pamir, June 17, 1894; 12,000 feet. "Length, 6½ inches."

The adult birds collected in August and September are rather small, the Thian-Shan specimen, particularly, inclining toward *S. deserti* in having a less amount of white on the inner webs of the wing feathers.

I think it will be necessary eventually to regard this form as a subspecies of *S. deserti*, and hence *Saxicola deserti montana* (Gould).

Measurements of adults of Saxicola isabellina.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Culmen.	Tarsus.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150377	Female ad.	Near Killian, Eastern Turkestan.	Aug. 8	3.67	2.50	0.53	1.01
150378	Female ad.	....do	....do	3.53	2.32	.57	1.02
150379	Male ad	Thian-Shan Mountains ..	Sept. 11	3.75	2.53	.53	1.06
150375	Male ad	Tagdumbash Pamir	May 1	3.92	2.57	.58	1.02
150376	Male ad	.....do	June 17	3.62	2.53	.57	1.07

62. PHOENICURUS ERYTHRONOTUS (Eversmann).

Female, adult, Aksu, Eastern Turkestan, November 27, 1893. "Bill and feet black; length, 6½ inches."

Male, adult, 30 miles south of Aksu, Eastern Turkestan, November 24, 1893. "Bill and feet black; length, 6⅜ inches."

63. PHOENICURUS RUFIVENTRIS (Vieillot).

Male, immature, Thian-Shan Mountains, north of Kashgar, September 15, 1893; 9,000 feet. "Bill and feet black; length, 5¾ inches."

Male, adult, Thian-Shan Mountains, north of Kashgar, September 16, 1893; 9,000 feet. "Bill and feet black; irides dark brown; length, 6 inches."

64. PHOENICURUS ERYTHROGASTER (Güldenstadt.)

Female, adult, Matan, 40 miles south of Aksu, Eastern Turkestan, November 27, 1893.

Female, adult, junction of Aksu and Kashgar rivers, Eastern Turkestan, December 2, 1893.

Male, adult, Sarikol, Eastern Turkestan, April 8, 1894; 10,400 feet.

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65. CYANECULA SUECICA (Linnæus).

Male, immature, Thian-Shan Mountains, north of Kashgar, September 16, 1893; 9,000 feet. "Bill, dark horn brown, yellowish at gape; length, 6 inches."

Female, Sarikol, Eastern Turkestan, April 8, 1894.

Male, immature, Killian, Eastern Turkestan, August 4, 1894; 6,000 feet.

The specimen from Sarikol, marked female, although a spring bird, is in the livery of an immature male.

66. MERULA MERULA INTERMEDIA, new subspecies.

Type.—No. 150443, U.S.N.M., female, adult; Aksu, Eastern Turkestan, November 20, 1893. Entire upper parts (forehead, crown, nape, back, scapulars, rump, and upper tail-coverts) slaty black, the feathers, especially on head and back, bordered with a paler, olive color, the general effect on the head and back being that of clove brown with an olive tinge; tail, dull black; wings, dark slaty brown, the feathers with an olive tinge on the outer webs; lesser, middle, and greater wing-coverts slaty black like upper parts, tinged with olive; primary coverts and outer greater coverts with a more conspicuous olive edging; axillaries and under wing-coverts dull drab gray, some of the longer feathers of the under wing-coverts with light russet shafts; lores and sides of head and neck clove brown with an olive tinge, like the crown; feathers of ear-coverts mostly with white shafts; malar stripe grayish white, broken by indistinct dusky brown edges to the feathers; chin, grayish white; throat similar but with many deltoid spots of clove brown, each spot indistinctly bordered with lighter brown; breast hair brown with an olive tinge, each feather with a deltoid spot of clove brown bordered with lighter brown, the spots larger than those on throat; lower breast, abdomen, sides of body, flanks, and under tail-coverts dull blackish slate, the lower breast with indistinct dark spots; an olive tinge on sides of body; feathers of center of abdomen and lower breast with light grayish borders; thighs, brownish drab. "Bill and feet black; irides, reddish brown; length, 11¾ inches." Wing, 5.28 inches; tail, 4.82; tarsus, 1.33; culmen, 0.95.

This bird resembles the common Blackbird, but is larger, being intermediate in size between it and *Merula m. maxima* (Seebohm) of Kashmir. It is darker and grayer (I am comparing adult autumn females) with less olive.

The breeding grounds of this bird must be pretty well north; Dr. Abbott's specimens were taken in the Thian-Shan Mountains late in November, and Dr. Scully states that the bird "migrated northward in spring" from Yarkand. The specimens recorded by Dr. Sharpe from various parts of Eastern Turkestan[1] under the name of *Merula maxima*

[1] Second Yarkand Mission, 1891, Aves, p. 91.

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were winter specimens, and it seems very probable that there is a considerable hiatus between the summer homes of the present form and *maxima*. If this prove to be the case I may be in error in considering *maxima* a subspecies of *Merula merula*.

Measurements of Merula merula intermedia.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150443	Female ad.	Aksu, Eastern Turkestan.	Nov. 20, 1893	5.28	4.82	1.33	0.95
150444	Female ad.	Karatol, Eastern Turkestan.	Nov. 24, 1893	5.12	4.50	1.31	1.94
	Female ad.	Europe, average of four skins.	Winter.	4.75	4.04	1.25	.84

The specimens collected by Dr. Scully at Yarkand[2] measured: Male, wing, 5.46 inches; tail, 5.15; tarsus, 1.30; bill from gape, 1.28. Female, wing, 5.40 inches; tail, "5.60;" bill from gape, 1.35. The length of tail in the last case may be a mistake for 5.06 inches.

The measurements given by Dr. Sharpe for a number of Eastern Turkestan specimens are in keeping with those mentioned above, the wings running from 5.20–5.40 inches, and the tails from 4.80–5 inches.

67. MERULA ATROGULARIS (Temminck).

Female, adult, Kok Kya, Thian-Shan Mountains, north of Kashgar, October 17, 1893; 9,000 feet. "Bill black, lower mandible yellow at base; irides dark brown; feet pale fleshy brown; length, 10 inches."

Female, adult, Aksu, Eastern Turkestan, November 23, 1893; 3,500 feet. "Length, 10 inches."

68. MONTICOLA SAXATILIS, Linnæus.

Male, immature, Thian-Shan Mountains, north of Kashgar, September 15, 1893; 9,000 feet. "Bill black yellowish at base below; legs brownish black."

Family CINCLIDÆ.

69. CINCLUS LEUCOGASTER, Bonaparte.

Male, adult, Tagdumbash Pamir, June 4, 1894; 13,000 feet. "Irides clear brown; length, 7§ inches."

Our specimen appears to be typical of *leucogaster*.

Family ACCENTORIDÆ.

70. PRUNELLA FULVESCENS (Severtzoff.)

Female, adult, Karakash River, Eastern Turkestan, August 3, 1893; 12,000 feet. "Bill black; irides pale brown; length, 6¼ inches."

Female, adult, Thian-Shan Mountains, north of Kashgar, September 13, 1893; 9,000 feet. "Bill black; irides pale brown; length, 6¼ inches."

[1] "Bill and feet black; irides dark brown; length, 11 inches."

[2] "Stray Feathers," IV, 1876, p. 139.

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Family MUSCICAPIDÆ.

71. MUSCICAPA GRISOLA, Linnæus.

Male, adult, Thian-Shan Mountains, north of Kashgar, September 11, 1893; 7,000 feet. "Length, 6¼ inches."

Family HIRUNDINIDÆ.

72. HIRUNDO URBICA, Linnæus.

Female, adult, Tagdumbash Pamir, June 19, 1894; 11,000 feet.

73. PTYONOPROGNE RUPESTRIS (Scopoli).

Female, adult, Kuen-Luen Mountains, near Kukiar, Eastern Turkestan, July 30, 1894; 9,000 feet.

74. CHELIDON RUSTICA (Linnæus).

Male, adult, Bora, Eastern Turkestan, August 11, 1893; 6,000 feet. "Bill and feet black; length, 8½ inches."

Family PICIDÆ.

75. DRYOBATES MAJOR LEUCOPTERUS (Salvadori).

Female, adult, Aksu, Eastern Turkestan, November 20, 1893. "Irides reddish brown; length, 9¾ inches."

Female, adult, Matan, 40 miles south of Aksu, Eastern Turkestan, November 27, 1893. "Length, 9¼ inches."

Male, adult, jungles on Kashgar River, 100 miles below Maralbashi, Eastern Turkestan, December 4, 1893.

Family UPUPIDÆ.

76. UPUPA EPOPS, Linnæus.

Female, adult, Sarikol, Eastern Turkestan, April 8, 1894; 10,400 feet.

Family MICROPODIDÆ.

77. MICROPUS APUS PEKINENSIS (Swinhoe).

Male, adult, Kukiar, Eastern Turkestan, July 27, 1894; 6,500 feet. "Length, 6¾ inches."

Female, adult, Kukiar, Eastern Turkestan, July 27, 1894; 6,500 feet. "Length, 7 inches."

Family COLUMBIDÆ.

78. COLUMBA RUPESTRIS (Pallas).

Male, adult, Thian-Shan Mountains, north of Kashgar, September, 1893; 9,000 feet. "Bill black; irides pale brown; length, 13 inches."

Female, adult, Little Kara Kul Lake, Sarikol, Eastern Turkestan, April 3, 1894; 12,000 feet. "Length, 12⅛ inches."

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79. TURTUR DOURACA STOLICZKÆ (Hume).

Male, adult, Ushturfan, Eastern Turkestan, November 11, 1893; 5,000 feet.

Female, immature, Ushturfan, Eastern Turkestan, November 11, 1893; 5,000 feet. "Length, 12¼ inches."

This is an easily recognized large pale form of *Turtur douraca*, and I do not hesitate to record it under the above name.

Family PTEROCLIDÆ.

80. SYRRHAPTES PARADOXUS (Pallas).

Male, adult, Pishak Sindi, east of Maralbashi, Eastern Turkestan, January 23, 1894. "Claws dark horny gray; length, 14¼ inches."

Male, adult, same locality and date. "Bill bluish white; irides dark brown; length, 15½ inches."

Female, adult, same locality and date.

81. PTEROCLES ARENARIUS (Pallas).

Female, adult, Akchi, valley of the Aksai, Eastern Turkestan, November 8, 1893; 7,500 feet. "Bill slaty blue; feet dirty leaden white, claws blackish; length, 13 inches."

Family PHASIANIDÆ.

82. TETRAOGALLUS HIMALAYANUS, Gray.

Male, adult, Tagdumbash Pamir, May 20, 1894; 15,000 feet. "Feet orange red, claws dull black; bill brownish horn; naked patch behind eye yellow; irides dark brown; length, 25¾ inches."

83. CACCABIS SAXATILIS CHUCAR (Gray).

Male, adult, Thian-Shan Mountains, below Saribeli Pass, October 28, 1893; 8,000 feet. "Length, 14¼ inches; weight, 1¼ pounds."

84. COTURNIX COTURNIX (Linnæus).

Male, adult, Thian-Shan Mountains, north of Kashgar, September 16, 1893; 9,000 feet. "Bill pale horn brown above, fleshy beneath; feet fleshy white; irides pale brown; length, 7¼ inches."

Female, adult, same locality and date. "Length, 8 inches."

85. PHASIANUS SHAWI, Elliot.

Male, adult, junction of the Aksu with the Kashgar, Eastern Turkestan, November 29, 1893. "Bill pale yellow horn, with a greenish tinge; irides yellow; orbital skin red; feet pale brownish flesh color; length, 32½ inches. Very fat; weight, 2 pounds 10 ounces."

Female, adult, junction of Aksu and Kashgar rivers, Eastern Tur-

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kestan, December 2, 1893. "Irides yellow; length, 23 inches; weight, 1½ pounds."

Female, adult, junction of Aksu and Kashgar rivers, Eastern Turkestan, December 2, 1893. "Length, 23½ inches; weight, 1 pound 7 ounces."

Male, adult, jungles on Kashgar River, 100 miles below Maralbashi, Eastern Turkestan, December 4, 1893. "Length, 34½ inches."

Male, adult, Kokchall, east of Maralbashi, Eastern Turkestan, February 12, 1894. "Length, 34½ inches."

Family ARDEIDÆ.

86. HERODIAS ALBA (Linnæus.)

Male, adult, jungles on Yarkand River, east of Maralbashi, Eastern Turkestan, January 4, 1894. "Bill orange yellow; legs black; irides pale yellow; length, 42¼ inches."

Family ANATIDÆ.

87. TADORNA CASARCA (Linnæus).

Male, adult, Kashgar River, near Maralbashi, Eastern Turkestan, March 1, 1894. "Bill and feet black; irides dark brown; length, 23½ inches; weight, 2¾ pounds."

88. NYROCA NYROCA (Güldenstadt).

Male, adult, near Maralbashi, Eastern Turkestan, March 2, 1894. "Feet slaty, webs black; bill black; irides white; length, 17 inches."

Family CHARADRIIDÆ.

89. ÆGIALITIS DUBIA (Scopoli).

Male, adult, Sarikol, Eastern Turkestan, April 9, 1894; 10,400 feet.

90. ÆGIALITIS PAMIRENSIS, new species.

Type.—No. 150169, U.S.N.M., male, adult; Tagdumbash Pamir, June 16, 1894; 12,000 feet. Crown, back, scapulars (tertiaries slightly darker), pale grayish brown, shafts of feathers darker; tail and wings somewhat darker brown; outer rectrix white except an almost obsolete dusky spot on inner web near end; rest of tail feathers narrowly tipped with white, and (except middle pair) largely white on inner web; primaries largely white on inner web; three innermost primaries with an irregular rectangular spot on the outer web near end; greater wing-coverts with broad white tips; some of the feathers of primary coverts narrowly tipped with white; longer secondaries with white outer webs; under wing-coverts pure white, without visible darker centers to the feathers. Throat, cheeks, abdomen, flanks, and under tail-coverts pure

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white; feathers of upper tail-coverts light grayish brown, largely edged and bordered with white; a broad pectoral band of cinnamon buff, continuous on sides of neck and nape, where more restricted, and extending narrowly on sides of body almost to flanks; forehead almost entirely black, the feathers with white bases; small spot of white on lores with black tips to the feathers; a narrow line of pale buff just posterior to black of forehead, and extending back on sides of crown. Wing, 4.93 inches; tail, 1.91; tarsus, 1.36; exposed culmen, .72. "Length, 7⅝ inches." Legs and feet bluish black in dried skin.

This species, of which Dr. Abbott sends only one specimen, has almost identically the same pattern of coloration as *Æ. mongola*, but the white forehead of the latter is nearly black in this; the colors are everywhere much paler; the pectoral band is cinnamon buff instead of russet; the dimensions are quite different,—a longer bill and tarsi, and shorter wings and tail. The table of measurements here given will illustrate these differences in proportions.

Measurements of Ægialitis pamirensis.

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
150169	Male ad...	Tagdumbash Pamir.....	June 16	4.93	1.91	1.36	0.72

Measurements of Ægialitis mongola (male).

U.S.N.M.	Sex.	Locality.	Date.	Wing.	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
89051	Male ad...	Bering Island.....	May 11	5.20	2.03	1.19	0.61
92778	Male ad...	.....do	May 14	5.04	2.04	1.12	.61
120583	Male ad...	Hakodate, Japan	May 10	5.49	2.19	1.20	.62
109423	Male ad...	Japan	Feb. 6	5.22	1.99	1.13	.64
		Average.....	.....	5.24	2.06	1.16	.62

Measurements of Ægialitis mongola (female).

U.S.N.M.	Sex.	Locality.	Date.	Wing	Tail.	Tarsus.	Culmen.
				Inches.	*Inches.*	*Inches.*	*Inches.*
89052	Female ad.	Bering Island.....	May 11	5.19	2.07	1.16	0.62
92779	Female ad.	.....do	Feb. 7	4.96	1.98	1.14	.59
92780	Female ad.	.....do	April 6	5.09	1.96	1.20	.63
131777	Female ad.	.....do	June 3	5.27	2.16	1.18	.60
		Average.....	.....	5.13	2.04	1.17	.61

91. VANELLUS VANELLUS (Linnæus).

Female, immature, Kargallik, Eastern Turkestan, August 12, 1893. Male, adult, Sarikol, Eastern Turkestan, April 6, 1894; 10,400 feet.

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Family SCOLOPACIDÆ.

92. TOTANUS TOTANUS (Linnæus).

Female, adult, near Kashgar, Eastern Turkestan, March 13, 1894. "Length, 11¼ inches."

93. TOTANUS OCHROPUS (Linnæus).

Male, adult, Suget, Eastern Turkestan, July 29, 1893; 13,000 feet. "Legs and feet leaden; bill black, greenish at base; irides dark brown; length, 9⅜ inches."

94. TRINGA TEMMINCKII, Leisler.

Male, adult, Tagdumbash Pamir, May 26, 1894; 14,000 feet. "Length, 6 inches."

95. SCOLOPAX RUSTICOLA, Linnæus.

Male, adult, Ushturfan, Eastern Turkestan, November 15, 1893. "Length, 13¼ inches."

96. GALLINAGO SOLITARIA, Hodgson.

Male, adult, Bulan Kul, road to Sarikol, Eastern Turkestan, April 2, 1894; 10,000 feet. "Length, 12 inches."

97. IBIDORHYNCHA STRUTHERSII, Vigors.

Female, adult, valley of the Aksu, Eastern Turkestan, November 9, 1893; 7,000 feet. "Bill dark carmine; feet dull pink; irides carmine; length, 17⅛ inches. Shot by D. T. Hanbury, esq."

Family RECURVIROSTRIDÆ.

98. HIMANTOPUS HIMANTOPUS (Linnæus).

Male, adult, Kargallik, Eastern Turkestan, August 12, 1893. "Legs pink; irides red; length, 14¾ inches."

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DESCRIPTIONS OF THREE SPECIES OF SAND FLEAS (AMPHIPODS) COLLECTED AT NEWPORT, RHODE ISLAND.[1]

By SYLVESTER D. JUDD.

WHILE at Mr. Agassiz's Newport laboratory in the summer of 1893, I collected a large number of crustaceans. Of these, the Amphipods particularly interested me. They were obtained by skimming the calm surface of Narragansett Bay at night with a "tow net."

Most of the Amphipods found in the skimmings or "tow" belonged to the family Gammaridæ, a typical representative of which is *Gammarus*, our common Sand Flea.

CALLIOPIUS RATHKEI (Zaddach).

Some little olive-colored Gammarids, which might at first be taken for *Gammarus*, proved to be very interesting. Unlike *Gammarus*, they did not rise to the surface of the water with a succession of springs, but moved rapidly through the water at a uniform rate. They often bumped against the side of the dish, but never stopped the incessant vibration of their legs until a secure hiding place had been reached.

Female.—A large white shield on the back formed a conspicuous and distinctive feature by which they were easily recognized. These Amphipods agree with the description of *Calliopius rathkei* given by Sars[2] more closely than with the description of any other known species. However, they constantly differ slightly from the European form[3] of that species in certain details, as for instance antennal sense organs, color, etc., which are sufficiently constant to warrant their description.

The points of difference may be considered in the following order: Color, size, coxæ, and calceoli.

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[1] For the invaluable aid received in the preparation of this paper, I have to thank Dr. W. Faxon and Prof. E. L. Mark, of Harvard University.

[2] Crustacea of Norway, 1893, I, Pt. 20.

[3] For the sake of convenience, I shall allude to the animals hitherto described, as the European form—to those which I have studied, as the American form—of *Calliopius rathkei*.

NOTE.—Abbreviations: *ant.* anterior; *d.* dorsal; *dist.* distal; *l.* lateral; *m.* median; *pot.* posterior; *px.* proximal; *v.* ventral.

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Sars,[1] in his description of the female, says: "Body semipellucid, with a yellowish violet tinge, and mottled with irregular specks of a clear orange hue, each segment being, moreover, bordered posteriorly by a narrow band of dark, reddish brown pigment; on the anterior part of the back occurs, besides, a rather conspicuous rounded shield of a silvery luster, occupying the dorsal face of the third and fourth segments of mesosome." The Newport specimens possess a silvery shield, like the European form, but the rest of the body is dark olive, thus making the animal opaque rather than semipellucid. From the tip of the rostral projection of the cephalon to the tip of the telson the American form measures 6.5 mm., the European only 6. The coxa of the last segment of the pereion (Fig. 1) is as long in the longitudinal as in

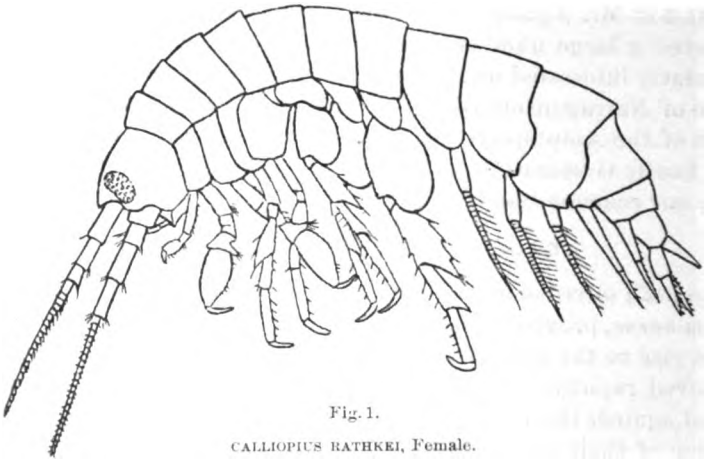

Fig. 1.

CALLIOPIUS RATHKEI, Female.

the dorso-ventral direction. In the specimen figured by Sars[2] the dorso-ventral measurement is not much more than half as great as the longitudinal.

Sars, in his work on the European form, figures calceoli,[3] but says nothing of their structure. In the American form, calceoli occur on both pairs of antennæ. Each calceolus consists of two parts. The basal or proximal part has the form of a wineglass. On this rests the distal part, which has the form of a slipper, the attachment being by means of the end corresponding to the heel of the slipper. While in Sars' specimens the heel and toe parts are in the same plane, in my specimens they are bent so as to make an angle of about 160° with each other.

The position of the calceoli is important. Each articulus of the flagellum of the *superior* antenna bears two calceoli, which are situated on the ventral portion of the articulus near the distal margin. Both may be seen in the view of the antenna from its median side (Fig. 2 *a*).

[1] 1893, I, Pt. 20, p. 448.

[2] Pl. 157, fig. 2.

[3] Pl. 157.

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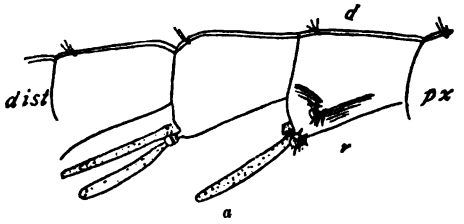
Small bristling hairs encircle the bases of both calceoli. The more ventral of the two calceoli is nearer the distal margin of the articulus and close to two long blunt cylindrical hairs. (Fig. 2 *b*, 2 *c*.)

These hairs obscure the ventral calceolus in a view from the lateral side, for they are just outside or lateral to the calceolus. In the enlarged view given by Sars[1] these ventral calceoli are seen with distinctness; just dorsal to a number of these ventral calceoli is a series of circles. If these circles are meant for calceoli, I think that Sars is in error, because the median calceoli lie on the opposite (median) face and could not be seen in this view of the appendage.



Sars states with emphasis that the terminal lappet of the third articulus of the flagellum has only two calceoli. The American representative has four at least.

Each articulus of the flagellum of the *inferior* antenna bears two calceoli on its median face (Fig. 3). One calceolus is more dorsal than the other. The dorsal calceolus springs from a point at some distance proximal to that from which the ventral calceolus arises. A lateral view of the appendage shows the calceoli only dimly, if at all, for the antenna is too opaque to allow them to be seen with distinctness through it. In a similar view, Sars shows distinctly the ventral calceoli, and leaves us to interpret a series of circles which lie dorsal to them.

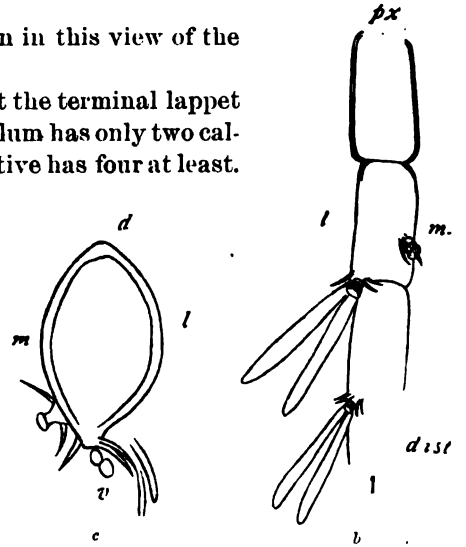


Fig. 2.

SUPERIOR ANTENNA OF CALLIOPIUS RATHKEI, Female.

(*a* Median surface with calceoli; (*b*) ventral surface of fifth to seventh segments; (*c*) cross section.

While there are two rows of calceoli on each of the antennæ of my specimens of *Calliopius rathkei*, in Sars' description of the genus *Calliopius*[2] I find no allusion to more than a single row of these organs; but, in view of the fact that *C. lævisculus* and the American form of *C. rathkei* both possess two rows of calceoli on each of the four antennæ, I am led to believe that the European form of *C. rathkei* probably also

[1] Pl. 157, fig. 2c.

[2] Specimens of *C. lævisculus*, which were procured from the Museum of Comparative Zoology in Cambridge, Massachusetts, through the kindness of Dr. Walter Faxon, showed two rows of calceoli on each antenna.

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possesses two rows, one of which has been overlooked by all previous writers.[1]

In the American representative of *C. rathkei*, the superior antenna appears more serrated than the inferior. This is because there are no calceoli on the ventral face of the inferior antenna. In Sars' figure both antennæ possess the same degree of serration, ventral calceoli occurring in both.

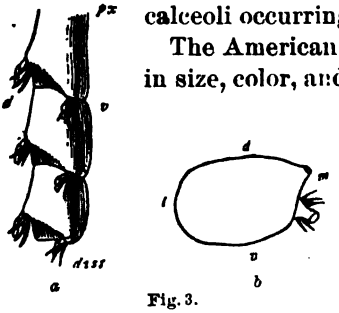

Fig. 3.

INFERIOR ANTENNA OF CALLIOPIUS RATHKEI, Female.

(*a*) Median view; (*b*) cross section; portions of both calceoli.

The American *C. rathkei* differs, then, from the European in size, color, and possibly in the number and arrangement of the antennal sense organs.

BYBLIS SERRATA.

The description of *Byblis serrata* given by Prof. S. I. Smith[2] is as follows:

Female: Dorsum rounded above, with no trace of a longitudinal carina upon the abdomen; third segment of the abdomen broadly rounded at the postero-lateral angle. Antennula about as long as the peduncle of the antenna; fourth segment of the peduncle of the antenna longer than the fifth. Inferior margins of the epimera of the first and second pairs of legs serrate, with slender and acute teeth alternating with the marginal cilia; carpus in the first pair scarcely if any longer than the propodus; carpus in the second pair very much longer than the propodus. In the third and fourth pairs of legs the dactylus as long as the propodus. Basal segment in the seventh pair of legs expanding distally, the posterior margin nearly straight, the anterior and inferior margins evenly arcuated, and reaching as far as the distal end of the carpus; the carpus about as long as the ischium and merus together, a little less than twice as long as broad, and armed with long spines upon the anterior and distal margins, but the posterior margin wholly unarmed; propodus almost as long as the carpus, and nearly four times as long as broad, anterior margin unarmed, the posterior armed upon the outside with two transverse rows of three or four spines, decreasing in size as they recede from the margin, the distal end with a spine each side the slender dactylus. Rami of the first pair of caudal stylets equal, as long as the base; outer rami of the second pair shorter than the inner; rami of the posterior pair equal, longer than the bases, reaching to the tips of the rami of the first pair. Telson as long as breadth at base, cleft rather more than half its length, the lateral margin arcuate and rapidly converging toward the evenly rounded extremity.

Alcoholic specimens are pale yellowish; the epimera, bases of posterior legs, and the sides of the abdomen specked and mottled with numerous points of dark pigment crowded irregularly together.

Length, 10–12 mm. Deep water off Vineyard Sound and Buzzards Bay.

To this accurate description of Professor Smith's I should like to add a general view (Fig. 4), and a few remarks about the living animal.

My specimens were skimmed from the surface at night. They were

[1] Through the kindness of Professor Sars, I have been able since writing this paper to examine several specimens of the European form of *C. rathkei* collected by him. These specimens were smaller than mine, but, like them, possessed two rows of calceoli on each of the four antennæ.

[2] Rept. U. S. Fish Com., 1871–72, p. 561.

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more sluggish than *Gammarus*, being wont to lie curled up on the surface of the water. In color they were translucent pearly white; around the bases of the legs of the pereion were fantastically branched stellate

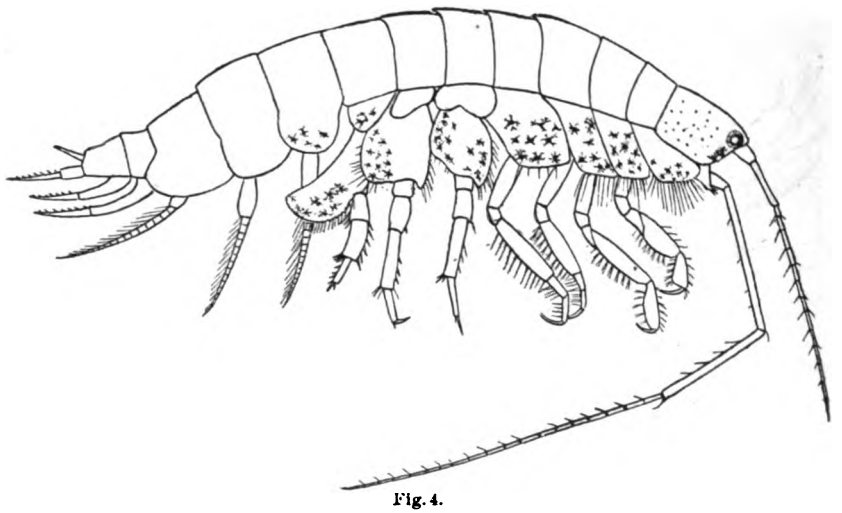

Fig. 4.
BYBLIS SERRATA, Female.

pigment cells of a rich purplish brown color. The mass of eggs in the brood pouch appeared like a claret-red globe. The four eyes were usually bright red, with considerable pigment around their sloping sides.

In a few individuals the eyes were *black*, and in alcoholic specimens the red eyes turn black.

Male.—In looking over several hundred specimens of *Byblis serrata*, now and then I came across one that had died in a straight condition, instead of being more or less curled up like the others. The straight ones possessed no incubatory pouch, were smaller, and had very long inferior antennæ; they were apparently the males of *Byblis serrata*, for they had serrated coxæ (Fig. 5).[1] The differences are those usually characteristic of the sexes in this genus.[2]

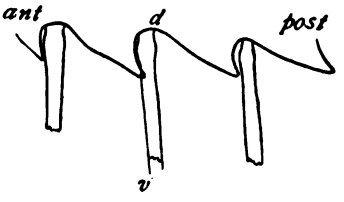

Fig. 5.
BYBLIS SERRATA, Female.
First coxa showing serration of ventral margin.

The antennæ especially are the organs which exhibit sexual dimorphism in the family Ampeliscidæ.

[1] For resemblances and differences compare figs. 4 and 6.

[2] See the table of sexual differences in *Byblis gaimardi*, a typical species of the genus, p. 601.

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The hairs on the peduncle of the superior antenna are arranged in bristle-like tufts in the male only. There is a collection of long hairs near the base of the flagellum in the male, but none in the female.

In the female the greater part of the hairs occur on the ventral side, while in the male the greater number are on the dorsal side. The

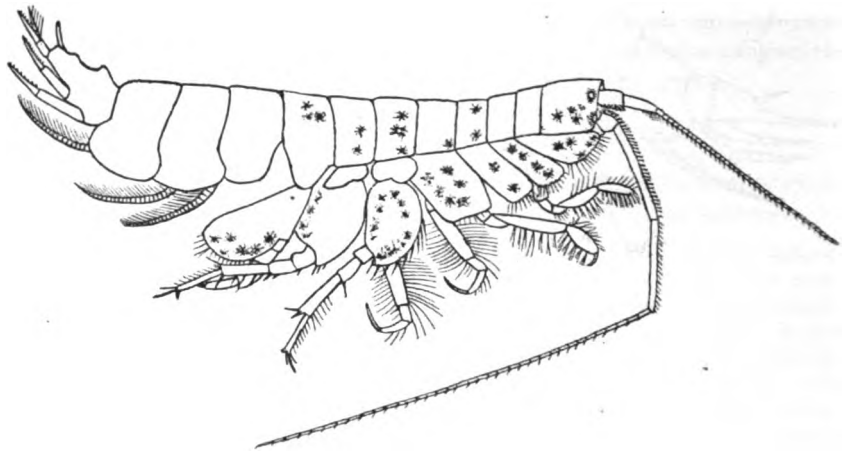

Fig. 6.

BYBLIS SERRATA, Male.

inferior antennæ of the male, like the superior ones, possess tufts of hairs on the peduncle; in the female these are wanting. In the male the third joint of the peduncle is swollen, and thus supports a larger number of tufts of hairs.

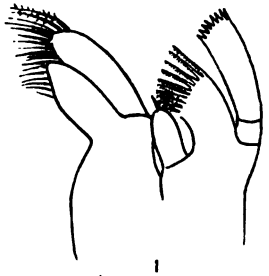

Fig. 7.

BYBLIS SERRATA. Female.

First and second maxillæ of left side, ventro-lateral surface.

The flagellum of the inferior antenna is greatly elongated in the male. This peculiarity as well as the increased number of olfactory tufts may be connected with the functions of the male in seeking the female.

The acute teeth on the ventral margin of the coxæ of the female are represented in the male by blunt cones.

In the male the last three segments of the pleon are so constricted at the articulation with the preceding segment of the pereion as to allow great freedom of motion to the terminal part of the body, and this may be of service in copulation. In this sex, too, the inner ramus of the last appendage bears, in addition to the rows of spines found on both rami of the female, long hairs. (See Fig. 8 *c*). These hairs probably aid in the union of the sexes. In both sexes the opposing edges of the rami are serrated; but they extend to the tip of the ramus in the male

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only. These serrated margins present a notch in the male (Fig. 8 *c*), but there is none in the female.

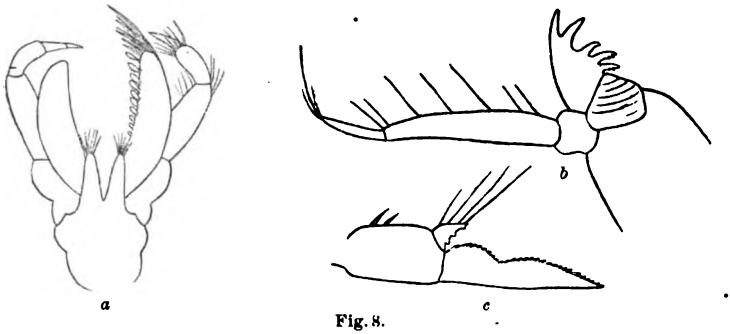

Fig. 8.

BYBLIS SERRATA.

(*a*) Maxilliped of female, ventral surface; (*b*) left mandible of female, median surface; (*c*) left pleopods of male, only basal portion of inner ramus.

A comparison of the sexes may be facilitated by the following table exhibiting some of the differences:

Sexual differences of Byblis serrata.

FEMALE.	MALE.
Length, 11 mm.	Length, 9.5 mm.
Superior antennæ one-third length of body.	Superior antennæ two-fifths length of body.
Peduncle: hairs not in tufts.	Peduncle: brush-like tufts of hairs.
No fringe of long hairs at base of flagellum.	Fringe of long hairs at base of flagellum.
Inferior antennæ three-fourths length of body.	Inferior antennæ 1½ length of body.
Peduncle: four-fifths of hairs on ventral side; no tufts of hairs; third joint not swollen.	Peduncle: four-fifths of hairs on dorsal side; brush-like tufts of hairs; third joint swollen.
Coxæ: serration of teeth acute.	Coxæ: serration of teeth blunt.
Incubatory pouch present.	Incubatory pouch absent.
Last three segments of pleon separated from pereion by a slight annular constriction; ultimate and antepenultimate segments without dorsal elevations.	Last three segments of pleon separated from pereion by a deep annular constriction; ultimate and antepenultimate segments with dorsal elevations.

Last pair of appendages very different in male and female.

BYBLIS AGASSIZI, new species.

About June 20, I obtained a dozen Amphipods that might be readily taken for the males of *Byblis longicornis*, for their inferior antennæ were longer than their bodies and they lacked pigment cells.

Type.—No. 18919, U.S.N.M.

The male of *B. longicornis* has not, so far as I can find, been described. It might therefore appear that these specimens were the undiscovered

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males of this species; but they differ from the females of *B. longicornis* in points which I think are not easily explained as due to differences of sex.

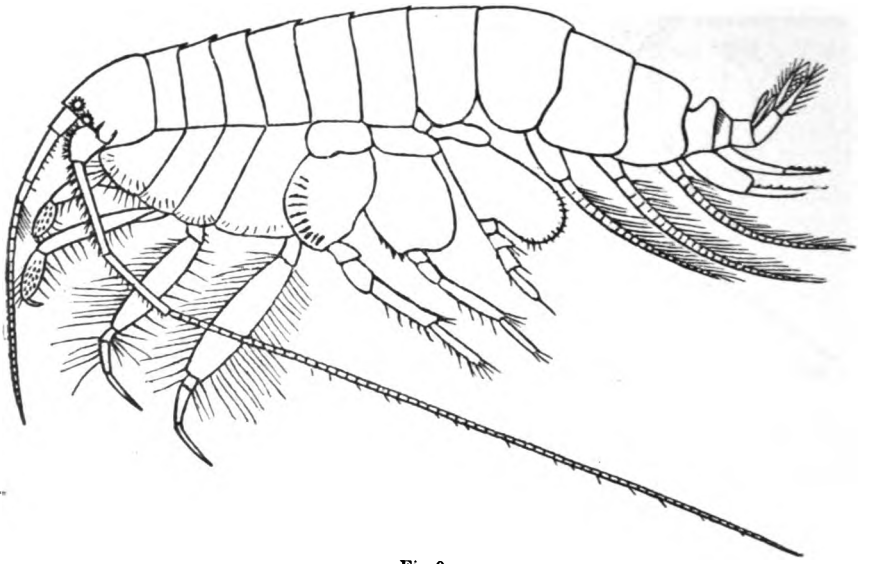

Fig. 9.

BYBLIS AGASSIZI, Male.

By studying the sexual differences exhibited by the type species of the genus, *B. gaimardii*, we shall be better prepared to state whether

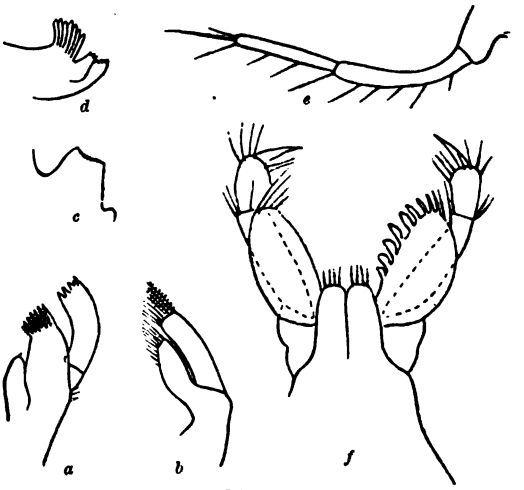

Fig. 10.

BYBLIS AGASSIZI, Male.

(*a*) First and (*b*) second maxillæ of left side, ventro-lateral aspect; (*c*) grinder in profile; (*d*) right mandible, median face of cutting edge; (*e*) palpus, median face; (*f*) maxilliped, ventral view.

or not a given difference is probably to be included under the category of sexual peculiarities.

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To render the comparison easier, I have tabulated the conditions, as follows:

Sexual differences of Byblis gaimardii.

FEMALE.	MALE.
Length, 15 mm.	Length, 13.5 mm.
Superior antennæ one-third length of body. Peduncle: Hairs not in tufts. No fringe of long hairs at base of flagellum.	Superior antennæ one-half length of body. Peduncle: Brush-like tufts of hairs. Fringe of long hairs at base of flagellum.
Inferior antennæ three-fourths length of body. Peduncle: Four-fifths of hairs on the ventral side; no tufts of hairs; third joint not swollen.	Inferior antennæ 1½ length of body. Peduncle: Four-fifths of hairs on the dorsal side; brush-like tufts of hairs; third joint much swollen.
Incubatory pouch present.	Incubatory pouch absent.
Last three segments of pleon separated from the pereion by a slight annular constriction.	Last three segments of pleon separated from the pereion by a deep annular constriction.
Rami of last pleopodos bear no long hairs.	Inner ramus of last pleopodos has long hairs on outer edge.
Telson as long as broad.	Telson longer than broad.

A comparison of the preceding table with that of the two sexes of *Byblis serrata* (p. 599) will further illustrate the nature of the characters that are subject to sexual dimorphism.

It will now be instructive to assume that the Newport specimens are males of *Byblis longicornis*, and to construct a provisional table exhibiting the differences between the two animals. The table is as follows:

Sexual differences of Byblis longicornis.

FEMALE.	MALE.
Length, 8 mm.	Length, 8.5 mm.
Superior antennæ two-thirds length of body. Peduncle: Hairs not in tufts. No fringe of long hairs at base of flagellum.	Superior antennæ two-fifths length of body. Peduncle: Hairs in brush-like tufts. Fringe of long hairs at base of flagellum.
Inferior antennæ 1½ length of body. Peduncle: Four-fifths of hairs on ventral side; no tufts of hairs; third joint not swollen.	Inferior antennæ 1½ length of body. Peduncle: Nine-tenths of hairs on dorsal side; brush-like tufts of hairs; third joint very much swollen.
Nine-tenths hairs on ventral side of flagellum.	Nine-tenths hairs on dorsal side of flagellum.
Incubatory pouch present.	Incubatory pouch absent.
Last three segmen s of pleon separated from pereion by a slight annular constriction.	Last three segments of pleon separated from pereion by a deep annular constriction.
Rami of last pleopodos bear no long hairs.	Two rami of last pleopodos bear long hairs on both edges.
Telson broader than long.	Telson twice as long as broad.

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This table is evidently inconsistent with the condition which obtains in *B. gaimardii* and other members of the family, for in this family the males should be smaller than the females and have longer antennæ.

The following is a table of other differences, which are sexual, if my specimens are males of *B. longicornis;* but if they are simply sexual differences, then this species exhibits by far the most exaggerated case of sexual dimorphism known in the family.

Byblis longicornis. FEMALE.	*Byblis, new species.* MALE.
Dorsum a continuous curve.	Dorsum showing toothed appearance just behind the cephalon.
Segmentation in both pairs of antennæ equally distinct.	Segmentation much less distinct in inferior pair of antennæ.
Ocular pigment "well defined."[1]	Ocular pigment absent.
Posterior margins of first four coxæ rounded.	Posterior margins of first four coxæ not so rounded, rather truncated.
Segments 5 and 6 of pleon have dorsal peaks.	Segments 5 and 6 of pleon have no peaks.

The following is a table of differences which affect parts not usually subject to sexual dimorphism in this family:

Byblis longicornis. FEMALE.	*Byblis, new species.* MALE.
Length, 8 mm.	Length, 8.5 mm.
Superior antennæ two-thirds length of body.	Superior antennæ two-fifths length of body.
Diameter of dorsal lens of eyes equal to diameter of ventral lens.	Diameter of dorsal lens of eyes two-thirds diameter of ventral lens.
Cephalon: "Lower corner well marked and sharp;"[2] much longer than broad.	Cephalon: Lower corner not sharp, slightly longer than broad.
Anterior periopoda: "Propodal joint little longer than carpal;" dactylus equals propodos.	Anterior periopoda: Twice as long as the carpal; dactylus longer than propodos.
No division between second and third last segments of pleon.	A V-shaped division area between last three segments of pleon.
Last pleopodos: "Opposite edges" of rami "finely serrated;" rami with no long hairs.	Last pleopodos: Opposite edges of rami not serrated; two rami bear on both edges long hairs.
Telson cleft one-fifth its length.	Telson cleft three-fourths its length.

[1] Sars' Crustacea of Norway, I, Pt. 9, p. 185.

[2] Loc. cit.

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The differences in the above table are so numerous and important as to warrant the belief that these specimens are the males of a new species of *Byblis*, for which I would suggest the name *Byblis agassizi*.

The following anatomical characters separate the new species from *B. longicornis:* It is larger, and has shorter superior antennæ (Fig. 9); the lower corner of the cephalon (Fig. 11 *c*) is not well marked. In alcoholic specimens no ocular pigment is found. The propodal joint of the anterior pereiopoda (fig. 9) is twice as long as the carpal. Each ramus of the last pleopodos (Fig. 11 *a*) bears long hairs on both edges. On the opposing edges of the rami no fine serration occurs. The telson is twice as long as broad, and bears a pair of minute hairs at its tip (Fig. 11 *a*).

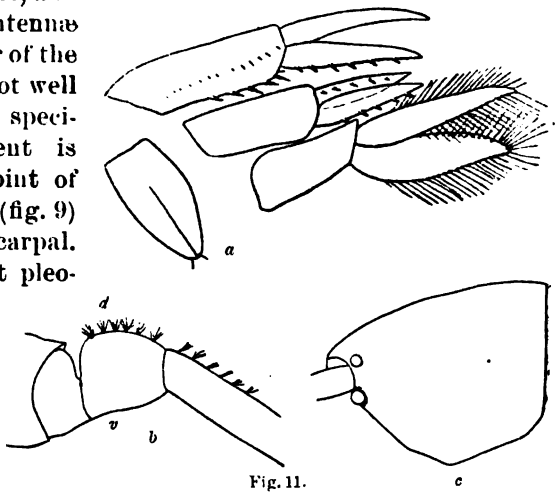

Fig. 11.

BYBLIS AGASSIZI, Male.

(*a*) Three last pleopods and telson, dorsal : spect (*b*) inferior antenna, four basal joints of peduncle ; (*c*) cephalon.

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REMARKS ON THE SYNONYMY OF SOME NORTH AMERICAN SCOLYTID BEETLES.

By the late WILLIAM EICHHOFF,
Of Strasburg, Germany.

(Translated and annotated by E. A. Schwarz.)

DURING the year 1892, Professor C. V. Riley entered into correspondence with William Eichhoff, of Strasburg, Germany, the well-known authority on Scolytidæ, with a view of getting this rather difficult family of Coleoptera properly identified for the U. S. National Museum collection. The correspondence resulted in exchange of specimens, and a series of our North American species was sent to Mr. Eichhoff by the Museum, care being taken to select such species as, upon comparison, with the types, would throw light on the confusion in synonymy between the North American species described by Chapuis and Eichhoff on the one hand and Zimmermann and Le Conte on the other. Some time before his death, Mr. Eichhoff sent an exchange series, partly composed of exotic species, which form a valuable addition to the Museum collection, and partly of North American species, mostly of his own types. The correspondence included very full synonymical remarks on many species, and these Professor Riley deemed of sufficient importance to justify publication. I have, therefore, at his special request, translated the substance of Dr. Eichhoff's determinations and comments, and added in brackets some notes of my own.—E. A. S.

HYLASTES RUFIPES, Eichhoff.

Hylastes pinifex, Fitch, and *H. rufipes*, Eichhoff, while both of them belong to the genus *Hylurgops*, Le Conte, are specifically quite distinct, differing more especially in the form of the antennal club. Quite characteristic is the form of the epistoma in *H. rufipes*, and your *Hylesinus opaculus*, as figured in the Annual Report of the Commissioner of Agriculture for the year 1878[1] and is probably referable to *Hylastes rufipes*. Quite recently I have received from Mr. A. D. Hopkins two specimens of a Scolytid which have the same formation of the epistoma and which no doubt belong also to *Hylastes rufipes*. Finally, I would suggest

[1] Plate v, fig. 3 *a*.

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that the three species *Hylesinus opaculus*, *sericeus*, and *trifolii* are more properly placed in *Hylastes* or *Hylurgops* than in *Hylesinus*.

[A typical specimen of *Hylastes rufipes* sent by Eichhoff proves to be identical with *Hylesinus opaculus*, Le Conte, the former name having priority.]

HYLURGUS SUBCOSTULATUS, Mannerheim.

Hylurgus subcostulatus, Mannerheim, is undoubtedly synonymous with *Hylastes alternans*, Chapuis, the former name being the older one.

HYLASTES PORCULUS, Erichson, and others.

When Erichson, in 1836,[1] established the new hylesinid genus *Hylastes*, he described, in connection with a large number of European species, but a single species from North America under the name of *H. porculus*, the typical specimen having been sent him by Zimmermann, from Pennsylvania. More than half a century has now elapsed, but the North American and European entomologists have not yet agreed about Erichson's species. It has been asserted by Le Conte that *Hylurgus scabripennis*, Zimmermann (described in 1868), is "certainly" identical with *porculus*, Erichson, but I have to dissent from this opinion for the following reasons:

Erichson says in his description: "Thorax *dense* ruditerque punctatus; elytra linearia, *dorso subdepressa*, punctis *grossis* striata, interstitiis *angustis*, *granulato-rugosis*, interioribus *elevatis*, *carinatis*, *sutura vero depressa*." Not one of these characters is to be seen in *H. scabripennis*, but just the opposite: Disk of elytra strongly convex, fine punctures at the bottom of the *narrow* elytral striæ, coarsely transversely-rugose interstices, which are wider than in the allied species. *H. cavernosus*, Zimmermann, on the contrary, agrees word for word with Erichson's description of *H. porculus*—densely and coarsely punctate thorax, narrow elytra with coarsely punctate striæ and narrow granulately punctate interstices. The first stria near the suture is much wider and more deeply excavated than the following, and this causes the disk of the elytra to be perceptibly deplanated, with the suture depressed and the following interstices somewhat carinately-convex. It appears to be beyond question that *H. porculus*, Erichson, is identical with *H. cavernosus*, Zimmermann, but not with *H. scabripennis*, Zimmermann.

H. granosus, Chapuis, is also identical with *H. porculus*, Erichson—a fact ascertained by me from the three specimens in my collection, which are the types of Chapuis. One of these I herewith send you.

Further, *H. salebrosus*, Eichhoff,[2] is unquestionably identical with *H. scabripennis*, Zimmermann, the former name having priority.

Finally, *H. scobinosus*, Eichhoff, is very closely allied to *H. salebrosus*. However, the form of the thorax, with its nearly straight sides which

[1] Wiegmann's Archiv, I, p. 49.

[2] Berl. Ent. Zeitschr., 1868, p. 146.

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gradually narrow from base to apex, is so characteristic that this difference can be perceived even with the naked eye. I have only two specimens of *H. scobinosus*, but I send you one of them. If you succeed in collecting more specimens, you will be able to ascertain whether we have to deal here with a good species or merely with a variety.

The synonymy of the species here discussed is as follows:

1. *Hylastes porculus*, Erichson (1836) = *carbonarius*, Fitch (1851) = *cavernosus*, Zimmermann (1868) = *granosus*, Chapuis (1869).

2. *Hylastes salebrosus*, Eichhoff (spring of 1868) = *scabripennis*, Zimmermann (fall of 1868).

3. *Hylastes scobinosus*, Eichhoff (1868).

[After a careful study of Erichson's description of *H. porculus*, I have come to the conclusion that Eichhoff's proposed synonymy will have to be adopted; Zimmermann probably never saw Erichson's description, and Dr. Le Conte misinterpreted it. Fitch's description of *H. carbonarius* is altogether too indefinite to permit any identification, but since *H. porculus* is the common species in the Northeastern States and *H. salebrosus* more southern in its distribution, the probability is that Fitch's species is *H. porculus*. Of *H. scobinosus* I only saw the single type specimen sent by Eichhoff to Professor Riley, and can only say that it represents a species distinct from *H. salebrosus*.]

DENDROSINUS GLOBOSUS, Eichhoff.

Of this species I received about twenty-five years ago two specimens from Dr. G. Kraatz, labeled "North America." Whether or not the locality is correct I am unable to say. I have never seen other specimens, but Chapuis must have received it also from South America. One of my specimens is herewith sent you.

[This is such a remarkable and easily recognizable insect that if it really belonged to our fauna it would have been rediscovered long ago. Dr. Le Conte was quite right in rejecting it from our lists.]

Genus HYLESINUS, Fabricius.

From the specimens of *H. aculeatus*, Say, sent me by you, I have fully convinced myself that Chapuis erroneously considered and described as *H. aculeatus* specimens of *H. imperialis*, which I had submitted to him. These are undoubtedly two quite different species. But at the same time I have been confirmed in my old supposition that *H. pruinosus*, Eichhoff, of which I possess only a single specimen, constitutes a third North American species with variegated color of the upper side. Finally, I have in my collection a specimen said to be from North America which I am unable to separate from the European *H. fraxini*.

[*H. aculeatus* is quite variable in the coloration of the upper side, and it is by no means apparent upon what reasons Mr. Eichhoff considers his *H. pruinosus* as distinct from *H. aculeatus*. *H. fraxini* is readily distinguished from *H. aculeatus* or *H. imperialis*, but I have never seen specimens from North America.]

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Genus PHLŒOSINUS, Chapuis.

Phlœosinus graniger, Chapuis, is undoubtedly identical with *dentatus* of Say, whose name has priority. But *P. haagii*, Eichhoff, seems to be unknown to American entomologists unless it be the female of *P. punctatus*. One of my two typical specimens of *P. haagii* is herewith sent to you.

Genus PHLŒOTRIBUS, Latreille.

That *P. granicollis* is identical with *P. frontalis*, Olivier, has already been recorded, but the Texan specimens of the latter you sent me are much smaller than my *P. granicollis*, of which I send you two specimens. My *P. setulosus* and *dubius*, however, are quite distinct from *P. frontalis;* the first-named species has on the first antennal joint a brush of hairs, as in the genus *Thysanoes*.

[The Texan specimens of *P. frontalis* were collected under bark of *Celtis* and are possibly specifically distinct from our Eastern specimens which infest *Morus*. The brush of hair on the first antennal joint has no specific value, but is merely a sexual character.]

Genera STEPHANODERES, Eichhoff, and HYPOTHENEMUS, Westwood.

I concede that a large majority, if not all, of the species described by me as *Stephanoderes* are congeneric with *Hypothenemus eruditus*, Westwood, as already intimated by me,[1] where I speak of *S. arecæ*, Hornung, as a probable synonym of *Hypothenemus eruditus*. But the question is whether Westwood's genus as originally described[2] can be considered as a valid one. Westwood gives as the *only* generic character the three-jointed antennal funicle; but this is erroneous, for I believe I have convinced myself that in *H. eruditus* the funicle is five-jointed. I consider, therefore, Westwood's name *Hypothenemus* as quite untenable, because founded upon a character that does not exist, and the name *Stephanoderes* has to take its place.

The North American specimens sent me by yourself as *H. eruditus* do not agree in many characters with Westwood's and Erichson's descriptions of this species, and I am inclined to consider your species as identical with *Stephanoderes crudiæ*, which was well described and figured as *Bostrychus crudiæ* by Panzer in 1791, from specimens found in some West Indian seed.

Of *Stephanoderes rotundicollis*, Eichhoff, I possess only a single specimen; *S. chapuisi*, Eichhoff (1871), is identical with *S. dissimilis*, Zimmermann (1868); and *St. sculpturatus*, Eichhoff (1879), is identical with the species you sent me as *H. erectus*, Le Conte.

[1] Ratio Ac. Tom., pp. 165, 166.

[2] Trans. Ent. Soc., London, I, p. 34.

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Genus PITYOPHTHORUS, Eichhoff.

Of the species sent by you, *P. pullus*, Zimmermann, is synonymous with *P. cribripennis*, Eichhoff; *P. hirticeps*, Le Conte, is extremely close to and perhaps identical with *P. pulchellus*, Eichhoff; *P. concentralis* from Florida is correctly determined and does not differ in the least from my typical specimen from Cuba; *P. querciperda*, Schwarz, is identical with my *P. pruinosus*.

[Typical specimens of *Pityophthorus infans*, Eichhoff, prove to be identical with *P. puberulus*, Le Conte.]

Genus PITYOGENES, Bedel.

Tomicus sparsus, Le Conte, *T. plagiatus*, Le Conte, and *T. carinulatus*, Le Conte, as well as their European allies, *T. bidentatus* and *T. chalcographus*, belong to Bedel's recently established genus *Pityogenus*. My statement[1] that *T. chalcographus* occurs also in North America is erroneous, since a renewed examination shows that the specimen is a female of *T. sparsus*, Le Conte, which has a most deceptive resemblance to *T. chalcographus*. *T. plagiatus*, Le Conte, is a good species and not identical with *bidentatus*, Herbst, as erroneously indicated by me.[2]

[To *Pityogenes* also belongs *Pityophthorus fossifrons*, Le Conte, which is evidently the female of a species, the male of which has hooked processes at the elytral declivity. From specimens recently submitted to me by Prof. A. D. Hopkins, I find that *Xyleborus punctipennis*, Le Conte, is also referable to *Pityogenes*, and that *Tomicus balsameus*, Le Conte, is the male of the same species.]

Genus XYLEBORUS, Eichhoff.

There can not be the slightest doubt that the species you sent me as *Xyleborus xylographus*, Say, and of which I had previously seen undetermined North American specimens, is identical with the European *X. saxeseni*, Ratzeburg. It is certainly remarkable that this synonymy comes to light only now, and that Ratzeburg's name has to be suppressed after it had been in use for more than fifty years. *X. pini*, Eichhoff, considered by Le Conte as synonymous with *X. xylographus*, must now again take its rank as a distinct species. What *X. pubescens*, Zimmermann, is, remains for the present unknown to me, since among the specimens which you send me as such I believe I can distinguish three species, viz, *X. affinis*, Eichhoff, *X. inermis*, Eichhoff, and a third one. These species of *Xyleborus* are extremely difficult to distinguish in the female sex, and I have no doubt that in this particular group still other species will be distinguished as soon as the males are discovered. These are wingless and can only be found within the galleries during the winter or in midsummer; very rarely also they may be seen near

[1] Die Europ. Borkenkäfer, p. 23.

[2] Ratio Tom., p. 280.

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the entrance of the galleries, but only shortly before the females are swarming.

[Say's orginal description of *Bostrichus xylographus* is very clear but greatly vitiated by the paragraph describing the galleries; for it is evident that a Scolytid excavating "immediately beneath the bark, on the wood, a rectilinear groove, with short, equal, lateral grooves at right angles with the preceding," can not be referred to any species of *Xyleborus*. This discrepancy can, however, be explained: The Scolytids described by Say[1] were sent to him by the younger Rev. J. F. Melsheimer from the old Melsheimer collection with the manuscript names[2] and notes by the elder Rev. F. V. Melsheimer. Among them were *Bostrichus xylographus*[3] and another species (No. 155), *B. xanthographus*. A description of the latter was either drawn up by Say or at least intended by him; but, at any rate, in Say's published paper the description itself is omitted and the paragraph referring to the gallery of *B. xanthographus* (which evidently is a species of *Pityophthorus*) became attached to the description of *B. xylographus*. Dr. E. F. Melsheimer was aware of this confusion and attempted to straighten it out[4] by quoting *Tomicus xanthographus* as a species distinct from *T. xylographus*. He also added, in his own copy of the old Melsheimer catalogue, the following manuscript note to *B. xanthographus*: "Differs from *xylographus* Say in having the posterior declivity slightly truncated, and in being somewhat less."]

[The following is a summary of the synonymy discussed in these notes:

Hylastes rufipes, EICHHOFF = *Hylesinus opaculus*, LE CONTE.

Hylastes porculus, ERICHSON = *cavernosus*, ZIMMERMANN, LE CONTE = *granosus*, CHAPMAN.

Hylastes salebrosus, EICHHOFF = *scabripennis*, ZIMMERMANN, LE CONTE.

Hylastes scobinosus, EICHHOFF, is to be added to our list.

Phlœosinus dentatus, SAY = *graniger*, CHAPUIS = *haagii*, EICHHOFF.

Hypothenemus crudiæ, PANZER = *hispidulus*, LE CONTE.

Hypothenemus dissimilis, ZIMMERMANN = *chapuisii*, EICHHOFF.

Hypothenemus erectus, LE CONTE = *sculpturatus*, EICHHOFF.

Pityophthorus cribripennis, EICHHOFF = *pullus*, ZIMMERMANN.

Pityophthorus pruinosus, EICHHOFF = *querciperda*, SCHWARZ.

Pityophthorus pulchellus, EICHHOFF probably = *hirticeps*, LE CONTE.

Pityophthorus puberulus, LE CONTE = *infans*, EICHHOFF.

Xyleborus xylographus, SAY = *saxeseni*, RATZEBURG.

Xyleborus punctipennis, LE CONTE, is the female of *Tomicus balsameus*, LE CONTE, and belongs to the genus *Pityogenes*.]

[1] Jour. Acad. Nat. Sci. Phila., 1826, V, pp. 317–319.

[2] Catalogue of Insects of Pennsylvania, 1806.

[3] No. 148 of the Catalogue.

[4] Catalogue of the Coleoptera of the United States, p. 87, 1853.

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FOSSIL JELLY FISHES FROM THE MIDDLE CAMBRIAN TERRANE.

By CHARLES D. WALCOTT,
Honorary Curator of the Department of Paleontology.

DURING the past nine years large collections of fossils have been made from the Middle Cambrian shales and limestones of the Coosa Valley, Alabama. At two horizons silicious concretions occur in the fossiliferous shale and, associated with them, what have locally been known as "star cobbles." Some of the latter suggest the sea-urchin, and others that are spread out on flat nodules resemble starfish. It was not until 1893 that I felt assured that the so-called "star cobbles" were fossil Medusæ. There are now more than 8,000 specimens in the collections of the United States Geological Survey. From this ample material two types have been separated that are allied to the recent Discomedusæ.

Numerous fragments of trilobites, etc., of Middle Cambrian age occur in the shale, and they are also attached to and embedded in many of the flattened nodules, and more rarely attached to specimens of the Medusæ. From the large number of specimens that have been found over a relatively small area, it is evident that they were gregarious and very much like the modern Rhizostome (*Polyclonia frondosa*) in their habits.

Two genera and three species have been recognized, namely: *Brooksella*, new genus, *B. alternata*, new species, *B. confusa*, new species, *Laotira*, new genus, and *L. cambria*, new species.

These forms, with *Dactyloidites asteroides* of the Lower Cambrian, may be grouped together in the family Brooksellidæ.

Family BROOKSELLIDÆ.

Discomedusæ with a lobate umbrella; without tentacles and central oral opening in the adult; with a radial canal in each lobe of the exumbrella, and a central stomach; oral arms central or represented by interradial arms or lobes attached to the central axis or to the subumbrella surface; reproduction sexual or by fission.

The following genera are included in the family: *Brooksella*, *Laotira*, and *Dactyloidites*.

BROOKSELLA, new genus.

Discomedusæ with a lobate umbrella, 6, 7, to 12 or more lobes; without tentacles and without (?) central oral opening; with a simple radial

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canal in each lobe of the umbrella and in each interradial lobe, when the latter is present. Oral plate quadripartite, with four oral arms starting out from it, but whether these branch or not is unknown. A second type of oral arms may be represented by the interradial lobes. Type, *Brooksella alternata.*

BROOKSELLA ALTERNATA, new species.

(Plate XXXI, figs. 1–5.)

The general form of the umbrella as now known varies from subspherical to a somewhat depressed convex disk. Following Hæckel, the dorsal surface will be called the *exumbrella;* the ventral surface, the *subumbrella;* the central section of the umbrella inclosing the stomach and oral organs, the *umbrella disk.*

In its original form the lobation of the exumbrella was more or less clearly defined and varied. Individuals occur of nearly the same size, with from six to twelve lobes; in some the lobation starts from the center of the umbrella, while in others a secondary system of lobes appears from beneath the upper lobes and gives great irregularity to the surface. The lobation of the umbrella is rarely, if ever, lost; it is the dominant character in all specimens.

The subumbrella varies to nearly as great a degree as the exumbrella; strong ridges or ribs radiate from the center to each of the principal lobes of the exumbrella. Sometimes the lobes separate above, so that there is little more than the central umbrella disk with a series of attached plates, like broad spokes in a wheel. The least compressed specimen is illustrated by Plate XXXI, figs. 2, 2*a*, and 2*b*. This, with Figs. 1, 1*a*, 3, and 3*a*, may be considered the types of the genus and species.

The gastrovascular system consists, as far as known, of a central stomach and a radial canal, which passes from it to each exumbrella lobe and interradial lobe.

No traces of an oral opening have been seen. In a few specimens a circular depression is seen at the base of the central axis, which was probably the locality of the mouth at an early stage in the evolution of the species and the development of the individual. One specimen shows the presence of four oral arms, which form an oral plate where they unite at the center. It is possible that the free interradial lobes or arms, attached to the central axis beneath or between the umbrella lobes, may have served the purpose of oral arms by carrying food to the central stomach. This certainly appears to have been the case in *Brooksella confusa*, where there is no evidence of the presence of regular oral arms.

BROOKSELLA CONFUSA, new species.

(Plate XXXI, figs. 7, 7*a*, 7*b*.)

In the external form and appearance of the exumbrella this species is similar to *B. alternata*, but differs materially in the arrangement of the lobes of the subumbrella. This is shown by the accompanying figure.

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The interlobes vary greatly in number and position, as shown by Plate XXXI, fig. 7*a*. The exumbrella surface is shown by Fig. 7*b*. There does not appear to be a true central oral opening; and a careful study of the specimens leads to the view that the free inter and basal lobes or arms served as the oral arms and conveyed food directly to the intestine or stomach in the central axis.

LAOTIRA, new genus.

Discomedusæ with a lobate umbrella, 4, 5, 6, 7, to 12 or more lobes in the simple forms, and with a larger number in the complex forms; without tentacles and without (?) central oral openings; with a simple radial canal in each lobe of the umbrella and in the interradial lobes, attached to the central axis, when they are present; oral arms represented by interradial lobes attached to the central axis and to the subumbrella lobes; reproduction sexual or by fission. Type, *Laotira cambria*.

LAOTIRA CAMBRIA, new species.

(Plate XXXII, figs. 1–8.)

The range of variation in this species is much greater than that of *Brooksella alternata*. Its general characteristics are shown by the figures illustrating it. In the simpler forms it has a radiating structure, very much like that of *B. alternata* (Plate XXXII, figs. 1, 2, and 3). A departure from this is shown in the subumbrella surface of Fig. 3*a*, and still more in Figs. 4 and 4*a*. This is carried still farther in Fig. 5. The tendency of the species to reproduce by fission is shown by Fig. 6.

This species possesses radiating canals in the exumbrella lobes in the simple forms and irregular canals in the complex forms, as shown by Plate XXXI, fig. 8.

No central oral openings have been seen, but there is an unusual development of the oral arms in the simple type; and in the complex type, the variation of which is almost endless, the oral arms appear to be numerous and attached irregularly to the subumbrella surface. This is partly shown by Fig. 4*a*.

This announcement is preliminary to a full illustration and description, which will appear as a monograph of the U. S. Geological Survey. A description will then be given of the mode of occurrence, conditions of preservation, and other facts which may be of interest in connection with this remarkable group of fossil Medusæ.

EXPLANATION OF PLATES.

PLATE XXXI.

Brooksella alternata.

FIG. 1. An exumbrella with nine lobes, and preserving a trace of the corona furrow in the ring about the central disk.

1*a*. View of the under or subumbrella side of fig. 1. The narrow subumbrella lobes are well shown, and also what appears to be the oral arms, *x x*. A slight circular depression at the center (*x'*) may indicate the position of an oral aperture.

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1. 2. Exumbrella view of an unusually rotund specimen. A projecting interradial lobe or arm is shown at *x*.

2*a*. Subumbrella view of fig. 2. The interradial lobe or arm is shown at *x*, and a broken subumbrella lobe at *b*. The interradial lobe at *a* did not connect with an exumbrella lobe.

2*b*. Side view of 2 and 2*a*. What is considered to be an interradial lobe is shown at *a*.

3. An exumbrella in which the interumbrella lobes are a prominent feature. The appearance is as though one medusa was resting upon and clasping the one beneath. The exumbrella lobes (*a* to *f*), however, merge into the subumbrella lobes, *a* to *f* of fig. 3*a*.

3*a*. Subumbrella view of fig. 3.

4. View of a specimen worn by erosion so as to show the radial canals of the exumbrella lobes.

5. Transverse section, cut so as to show the radial canals of the six umbrella lobes and the central stomach of the umbrella disk.

6. Side view of a specimen in which the subumbrella lobes are shown beneath the broader exumbrella lobes.

Brooksella confusa.

FIGS. 7, 7*a*. Views of the exumbrella and several of the interradial lobes. The relations of the two sets of lobes are shown by the side view, fig. 7*a*.

7*b*. Subumbrella surface of fig. 7. The irregular arrangement of the lobes and the oral arms is well shown.

Laotira cambria.

FIG. 8. Transverse section of an irregularly lobed specimen, showing the arrangement of the exumbrella canals.

PLATE XXXII.

Laotira cambria.

FIG. 1. Subumbrella view of a small specimen with four lobes.

2. Exumbrella view of a small specimen with six lobes. In both figures, 1 and 2, the original form has been obscured by a deposit of silicious matter about the lobes.

3. A typical illustration of the regular variety of the species. It has five principal exumbrella lobes and two small interradial lobes.

3*a*. Subumbrella view of fig. 3. The five subumbrella lobes are united at the center, but not with the same regularity as in *Brooksella alternata*. (See Plate XXXI, fig. 1*a*.)

4. Exumbrella view of an irregularly lobed specimen.

4*a*. Subumbrella view of fig. 4. The slight irregularity of arrangement of fig. 3*a* has increased, and two centers united by a transverse lobe are shown. One of the oral arms is shown at *x*.

5. Dorsal surface of an elongate specimen, in which three centers are connected by lobes radiating from one to the other.

6. A worn specimen in which fission has proceeded so far as to leave but one lobe connecting what are otherwise two individual specimens.[1]

[1] For fission in Medusæ, see Dr. Arnold Lang's memoir on *Gastroblasta raffaeli*.

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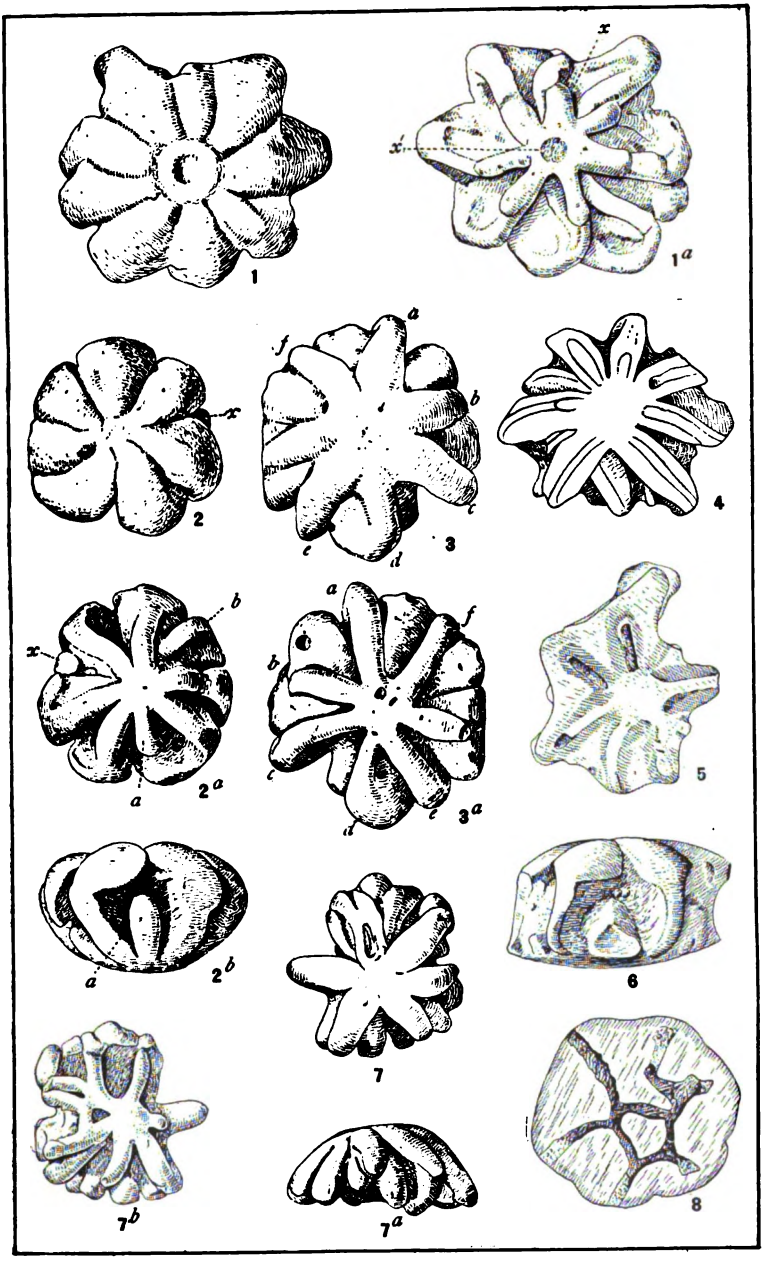

CAMBRIAN FOSSIL MEDUSÆ

FOR EXPLANATION OF PLATE SEE PAGES 613-614

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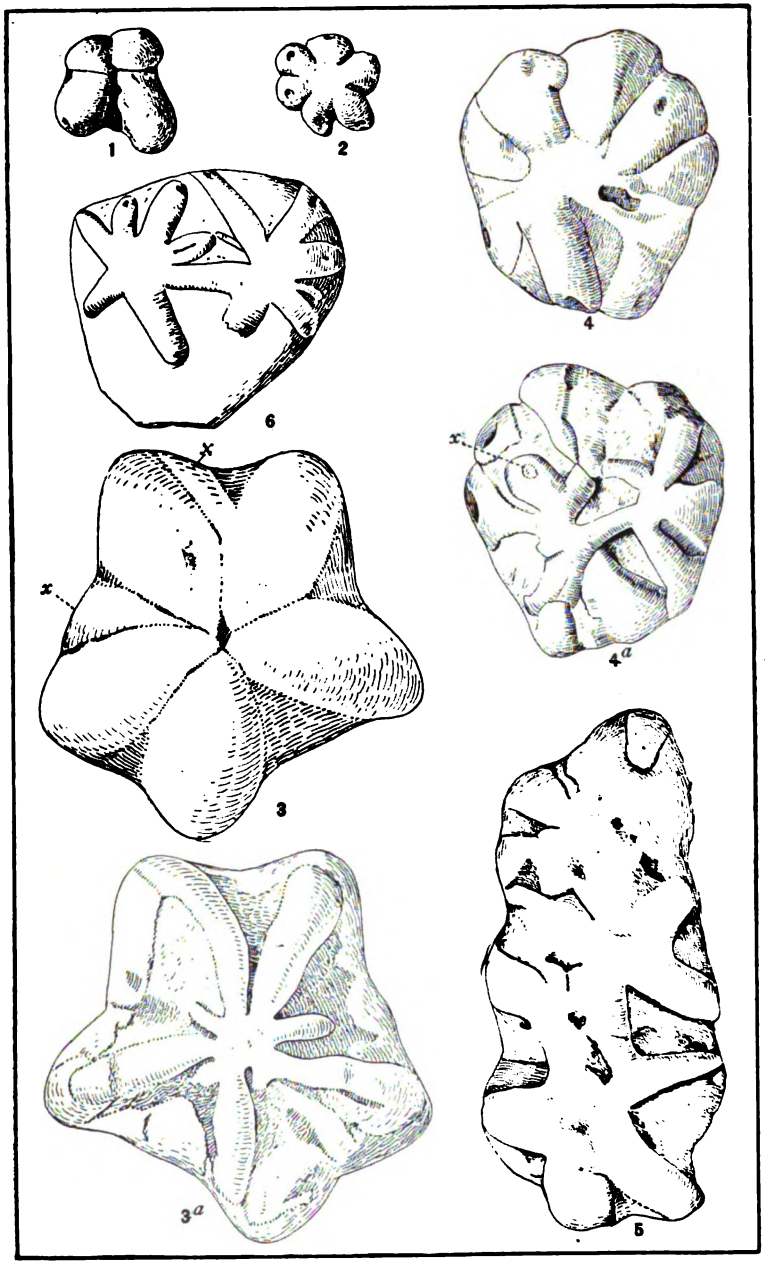

CAMBRIAN FOSSIL MEDUSÆ

FOR EXPLANATION OF PLATE SEE PAGE 614

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PRELIMINARY DESCRIPTIONS OF A NEW GENUS AND THREE NEW SPECIES OF CRUSTACEANS FROM AN ARTESIAN WELL AT SAN MARCOS, TEXAS.

By JAMES E. BENEDICT,
Assistant Curator, Department of Marine Invertebrates.

ON JANUARY 18, 1896, the United States Fish Commission completed an artesian well at San Marcos, Texas. The depth of the well is 188 feet. The flow of water obtained amounts to more than 1,000 gallons per minute. The water is pure and of excellent quality, and has a temperature of 73° Fahrenheit.[1]

Since the completion of the well, there have been taken from the water several specimens of a tailed batrachian, numerous shrimps of the genus *Palæmonetes*, a lesser number of Isopods of a new genus, and a very few Amphipods. All are blind.

PALÆMONETES ANTRORUM, new species.

As might be expected, the eye-stalks of the specimens are without pigment spots of any kind, nor does clearing the stalk in glycerine show lens structures. The rostrum is short and deep, with from ten to twelve sharp teeth on the upper margin and none on the lower. The point of the rostrum is sharp and very short. The antennal scale extends beyond the rostrum one-half of its length. The flagella of the antennæ are 30 mm. in length, in specimens 18 and 20 mm. long. The flagella of the antennulæ are elongated, the longer ones equaling the length of the body. The feet are all very long and slender, reaching far beyond the antennal scale.

Type.—No. 19326, U.S.N.M.

CIROLANIDES, new genus.

Eyes none. Peduncle of antennulæ with three segments and an elongated flagellum. Peduncle of antennæ with five segments. Peduncle of uropods not produced at the inner posterior angle. Lacinia of the

[1] From a note by Prof. B. W. Evermann accompanying the specimens

[Advance sheets of this paper were published April 14, 1896.]

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second article of the maxillipeds armed with a single hook. The first pair of legs are strongly prehensile. The six following pairs are proportionally much more slender and are ambulatory in character. The maxillipeds and mouth-parts are distinctively those of the Cirolanidæ.

CIROLANIDES TEXENSIS, new species.

The body is subovate, about 2½ times as long as broad. The head is well rounded behind and a little flattened in front. The antennulæ extend around the sides nearly to the posterior margins of the second segment of the pereion. The basal article of the peduncle is nearly spherical; the two following articles are elongated and nearly equal in length. The flagella are composed of about fifteen segments, of which the first is very short, the next is about twice as long as broad, and the following segments are about equal in length and breadth. The basal article of the antennæ is very short and broad, the second and third articles are a little longer than broad, the fourth and fifth articles are much more elongated, the fifth being the longer. The flagellum is composed of about thirty segments, of which the first is the longest, and the second or third the shortest, in proportion to the breadth. A very sharp rostral spine extends beyond the basal article of the peduncles of the inferior antennæ. The first pair of feet are short and stout and strongly prehensile. The six following pairs are ambulatory and much longer and more slender than usual in the family. The segments of the pleon are produced at the sides to sharp points conspicuous from above. The telson is wide, rounded on the posterior margin, and completely covers the articulation of the uropods. Length, about 14 mm. Color of alcoholic specimens, white.

Type.—No. 19327, U.S.N.M.

CRANGONYX FLAGELLATUS, new species.

This blind species is more closely related to *C. mucronatus*, Forbes, than to any other American species. It is, however, much stouter, and can be distinguished from it at sight. The head is a little longer than the first segment of the pereion. It is proportionally narrower and more concave at the insertion of the upper antennæ than in *C. mucronatus*. The peduncle of the upper antennæ has about the same proportions as in *C. mucronatus*. The flagella of a large specimen are as long as the body, numbering 61 segments on one side and 59 on the other; the flagella of some small specimens have but 40 segments. The peduncles of the lower antennæ are longer than those of the upper. The flagellum on one side is composed of 19 segments, on the other side of but 12; in small specimens the segments are from 8 to 12 in number. The first and second pairs of legs are about equal in length; the dactyls close down between two rows of bifurcate spines. *C. mucronatus* has about 15 such spines to the row, while this species

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has 24. In a specimen about 14 mm. long, the first and second pairs of legs are 4 mm. in length; the third, fourth, and fifth about 8 mm.; and the sixth and seventh, 11 mm. The telson is about three times as long as broad at the base, is much flattened, and tapers slightly to its subtruncate extremity. The first and second pairs of uropods extend far beyond the tip of the third pair; in *C. mucronatus* the first and second pairs extend but little beyond the third pair. Color of alcoholic specimens, white.

Type.—No. 19328, U.S.N.M.

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DESCRIPTION OF A NEW GENUS AND SPECIES OF BLIND TAILED BATRACHIANS FROM THE SUBTERRANEAN WATERS OF TEXAS.

By LEONHARD STEJNEGER,
Curator of the Department of Reptiles and Batrachians.

FOUR YEARS AGO it was my good fortune to announce the discovery of a blind cave salamander (*Typhlotriton spelæus*) on our continent, which I then characterized as "one of the most important and interesting herpetological events of recent years."[1] The animal to be described now is also a blind salamander-like batrachian, and its discovery is even more important and interesting than the former.

From an artesian well, 188[2] feet deep, recently bored at San Marcos, Texas, by the United States Fish Commission, more than a dozen specimens of a most remarkable tailed batrachian have been expelled, together with numerous crustaceans, no less remarkable, which will be described by Mr. Benedict in these "Proceedings."

These animals, by their want of external eyes and their white color, at once proclaimed themselves as cave-dwellers, but their extraordinary proportions, absolutely unique in the order to which they belong, suggest unusual conditions of life, which alone can have produced such profound differences. The most startling external feature is the length and slenderness of the legs, like which there is nothing among the tailed batrachians thus far known. While the normal number of fingers and toes is present (4 and 5), it is worthy of note that not only is there a great variation in the relative length of these members, but even the length of the legs in the same animal may differ as much as two millimeters. Viewed in connection with the well-developed, finned swimming-tail, it can be safely assumed that these extraordinarily slender and elongated legs are not used for locomotion, and the conviction is irresistible that in the inky darkness of the subterranean waters they serve the animal as feelers, their development being thus parallel to

[1] Preliminary Description of a New Genus and Species of Blind Cave Salamander from North America, Proc. U. S. Nat. Mus., XV, pp. 115–117, pl. IX.

[2] The depth of this well in the Advance Sheet, April 15, 1896, was given as 181 feet, which has since been found to be incorrect.

Proceedings of the United States National Museum, Vol. XVIII—No. 1088.

[Advance sheets of this paper were published April 15, 1896.]

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the excessive elongation of the antennæ of the crustaceans, of which I have been informed by Mr. Benedict.

The external gills at once suggested that these animals might be only larvæ. The fact that one of them contained large eggs, and that another expelled three eggs after being caught, was no positive proof to the contrary, but in conjunction with the affinity of the species to other forms known to have persistent gills throughout life, it makes it absolutely certain that we have to do with an adult and final animal.

A rough skeleton has been made, and studied as well as the short time since its preparation would allow. It is the intention of the writer later to present, in conjunction with Mr. F. A. Lucas, a detailed description of the anatomy, and an elaborate comparison with allied forms. So far as our studies have proceeded, they indicate that the animal belongs to the superfamily Proteoideæ, which embraces the *Proteus*, the elongated, eel-shaped, but likewise blind, cave species, from the subterranean waters of the region at the head of the Adriatic Sea, and the water-dog or mud-puppy (*Necturus*), with functional eyes and less elongate body, of our own continent. Suffice it to say at the present time, that Mr. Lucas and I have made out the presence of what appears to be the *intercalary* bone: maxillaries are apparently wanting; intermaxillaries and mandible are toothed. In addition, it may be asserted that the new genus here introduced is more nearly allied to *Necturus* than to *Proteus*, though between it and the former there is a vast gap.

TYPHLOMOLGE,[1] new genus.

Tongue moderate, anterior border free; vomero-palatine teeth in a strong series; limbs excessively elongated; fingers four, toes five; eyes entirely concealed under the skin; gill rami long, simple, fimbriæ long and slender.

Type.—*Typhlomolge rathbuni*, Stejneger.

TYPHLOMOLGE RATHBUNI, new species.

Diagnosis.—Head large, nearly as long as distance between axilla and groin; snout greatly depressed, nearly square anteriorly; limbs excessively slender and elongated, hand overlapping knee and foot overlapping elbow when adpressed to the side of the body; tail compressed, finned, pointed; color nearly white.

Habitat.—Subterranean waters near San Marcos, Texas.

Type.—No. 22686, U.S.N.M.; San Marcos, Texas; end of February, 1896.

Description of type specimen.—Head excessively large and broad, the distance from tip of snout to base of upper gill branch but slightly less than distance between axilla and groin, its width equal to one-half the latter distance; snout very much depressed, broad, truncated, nearly

[1] *Typhlos*, blind, and *molge*, the name of a salamandroid genus.

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square anteriorly; nostrils widely separated at the corners of the truncated snout, their distance greater than that between the eyes, which are deeply hidden under the skin and only visible as two small dark spots; mouth comparatively small, with strongly developed labial lobes; body short and slender, the distance between axilla and groin being but slightly greater than length of head and only one-half the length of the tail, its width being much less than that of the head and even less than that of the snout; limbs excessively slender and long, of nearly even length, about one-fifth of the total length; fingers overlapping knee and toes overlapping elbow when adpressed to the sides of the body; fingers four, toes five; short, slender, free, with rounded tips, their relative length variable; tail comparatively long, nearly one-half the total length, much compressed, finned below and particularly strongly above, the end pointed.

Skin smooth; a very strongly marked gular fold; a well marked vertebral groove; eleven costal grooves. Teeth on intermaxillaries and mandible small; the vomero-palatine teeth large, decreasing in size at both ends. Gill branches long and slender, the middle one longer; fimbriæ long and slender, not bushy.

Color nearly white, semitransparent, the upper surfaces densely sprinkled with minute pale gray dots.

Dimensions.—Total length, 102 mm.; from snout to anus, 53; from snout to gular fold, 16; from snout to beginning of upper gill branch, 22; width of head, 13; width of snout, 9; distance between nostrils, 7; distance between eyes, 6; distance between axilla and groin, 25; fore limb, 20; hind limb, 20; longest finger, 2.3; longest toe, 2.5; width of limbs, 1.7; tail, 11.

I take great pleasure in dedicating this most interesting novelty to Mr. Richard Rathbun, in recognition of his eminent services to science, both as a naturalist and as the head of the scientific staff of the United States Commission of Fish and Fisheries.

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DESCRIPTION OF A NEW STICKLEBACK, GASTEROSTEUS GLADIUNCULUS, FROM THE COAST OF MAINE.

By W. C. KENDALL, A. M.,
Assistant, United States Fish Commission

WHILE cruising on the Maine coast, on the United States Fish Commission schooner *Grampus*, during the mackerel investigation of the summer of 1895, the writer caught in surface and scoop nets a number of sticklebacks which differed widely from *Gasterosteus bispinosus*, many of which were caught in the same localities and under the same conditions. While *G. bispinosus* was abundant all along the coast, the form now described was apparently confined to an area within a few miles of Seguin Island. They were found under floating rock-weed (*Fucus nodosus* and *F. vesiculosus*), large quantities of which were encountered on the coast this summer. Often associated with the two kinds of sticklebacks mentioned were young hake (*Phycis chuss* or *P. tenuis*), young lumpfish (*Cyclopterus lumpus*), and pipefish (*Siphostoma fuscum*).

The stickleback here described seems to differ considerably from the description of any other stickleback known from the western Atlantic Coast. It is related, however, to *G. bispinosus*, approaching more or less closely the variety *atkinsii* of Schoodic Lakes. Although Dr. Boulenger of the British Museum finds wide variations in the dermal armature of *G. aculeatus*, as also does Mr. Cloudsley Rutter, in the sticklebacks of the Pacific Coast, there seem to be sufficient other differences to establish this form as a distinct species. The main points in which it differs from *G. bispinosus* are the deeper body, fewer fin rays, fewer dermal plates, unkeeled caudal peduncle, ventral spines serrated above and below, and a strong cusp at the base of each ventral spine, both above and below. In identifying and describing this stickleback I am greatly indebted to Prof. B. W. Evermann for kindly allowing me free use of proof sheets of Jordan and Evermann's Fishes of North and Middle America.

The following is a description of the heretofore undescribed form, together with measurements and observations on the cotypes:

GASTEROSTEUS GLADIUNCULUS,[1] new species.

Description.—Head, $3\frac{1}{3}$; depth, $3\frac{1}{5}$; D. II—I, 10; A. I., 8. Head rather long; eye about three times in head; opercle not striate; body deep,

[1] Gladiunculus, little sword; sticklebacks being called by the boys about Portland, Me., "Little swordfish."

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compressed, with five lateral dermal plates anteriorly counting from pectoral fin, none posteriorly; caudal peduncle short, naked, not keeled; innominate bone lanceolate, its width about three times in length; ventral spines rather long, about one and three-fifths times in head, serrated above and below, a strong cusp at base on both upper and lower edge.

Color in life grass green, mottled and finely punctated with black on top of head and back; sides of head and body golden, with dark blotches; breast silvery, ventrals scarlet. In alcohol the back becomes smoky black, the mottling and black dots more distinct, the golden hue of the sides fades, becoming more or less silvery, the dark blotches more pronounced.

Type.—No. 47589, U.S.N.M.; a specimen $1\frac{7}{16}$ inches long, caught about 4 miles off Seguin Island, Maine, September 9, 1895; cotypes Nos. 47590 and 47591, U.S.N.M.

Measurements of Gasterosteus gladiunculus.

Date.	Locality. North latitude.			Locality. West longitude.			Length in inches.	Head in length.	Depth in length.	Dorsal fin.	Anal fin.	Dermal plates.
1895.	°	′	″	°	′	″						
Aug. 5	43	29	30	69	57	30	1	$3\frac{1}{3}$	$3\frac{1}{3}$	II-I, 9	I, 8	5
Aug. 5	43	29	30	69	57	30	$1\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$	II-I, 9	I, 8	5
Aug. 7	43	30	00	69	45	00	$1\frac{3}{16}$	$3\frac{1}{3}$	$3\frac{1}{3}$	II-I, 9	I, 7	6
Sept. 6	43	28	45	69	42	45	$1\frac{1}{4}$	$3\frac{1}{3}$	4	II-I, 9	I, 8	8
Sept. 6	43	28	45	69	42	45	$1\frac{5}{16}$	$3\frac{1}{3}$	$3\frac{1}{3}$	II-I, 10	I, 8	5
Sept. 6	43	28	45	69	42	45	$1\frac{1}{4}$	$3\frac{1}{3}$	$3\frac{1}{3}$	II-I, 10	I, 7	5
Sept. 6	43	28	45	69	42	45	$1\frac{1}{4}$	$3\frac{1}{3}$	4	II-I, 10	I, 7	124
Sept. 6	43	29	30	69	41	15	$1\frac{1}{4}$	$3\frac{1}{3}$	$3\frac{1}{3}$	II-I, 10	I, 8	6
Sept. 7	43	31	15	69	44	00	$1\frac{1}{4}$	$3\frac{1}{3}$	4	II-I, 9	I, 8	4

For purposes of comparison, measurements of *G. bispinosus* taken in the same locality at the same time are here given:

Measurements of Gasterosteus bispinosus.

Date.	Locality. North latitude.			Locality. West longitude.			Length in inches.	Head in length.	Depth in length.	Dorsal fin.	Anal fin.	Dermal plates.
1895.	°	′	″	°	′	″						
Aug. 6	43	21	15	70	2	45	$1\frac{7}{16}$	$3\frac{1}{3}$	$4\frac{1}{3}$	II-I, 13	I, 9	31
Aug. 6	43	21	15	70	2	45	$1\frac{1}{4}$	$3\frac{1}{3}$	$4\frac{1}{3}$	II-I, 13	I, 9	31
Aug. 6	43	21	15	70	2	45	$1\frac{1}{8}$	$3\frac{1}{3}$	$4\frac{1}{3}$	II-I, 13	I, 8	31
Sept. 6	43	28	45	69	42	45	2	$3\frac{1}{3}$	4	II-I, 14	I, 9	32
Sept. 6	43	28	45	69	42	45	$1\frac{7}{8}$	$3\frac{1}{3}$	$4\frac{1}{3}$	II-I, 12	I, 8	31
Sept. 6	43	28	45	69	42	45	$2\frac{1}{8}$	$3\frac{1}{3}$	$4\frac{1}{3}$	II-I, 13	I, 10	33
Sept. 6	43	28	45	69	42	45	$1\frac{3}{4}$	$4\frac{1}{3}$	$4\frac{1}{3}$	II-I, 12	I, 8	31
Sept. 6	43	28	45	69	42	45	$1\frac{1}{2}$	$4\frac{1}{3}$	$4\frac{1}{3}$	II-I, 12	I, 8	28

[1] This specimen differs somewhat from the typical form and approaches *G. bispinosus* in having lateral dermal plates the whole length of the body (the last 12, however, being very small), and having a very slight keel on the caudal peduncle. In other respects it is like the typical form.

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DESCRIPTION OF A NEW SPECIES OF ANT THRUSH FROM NICARAGUA.

By CHARLES W. RICHMOND,
Assistant Curator of the Department of Birds.

SEVERAL SPECIMENS of an Ant Thrush of the genus *Phlegopsis* formed part of a collection made by the writer in eastern Nicaragua during the year 1892. These, when compared with Panama examples of *P. macleannani*, were found to be quite aberrant in coloration, but the series at that time available in the U. S. National Museum collection was not thought sufficient to warrant their separation as a distinct species. The Museum has since received many additions to its series of neotropical birds, among them three or four examples of the Panama form of *Phlegopsis*, which prove conclusively the distinctness of the Nicaraguan bird, a description of which is presented herewith.

PHLEGOPSIS SATURATA, new species.

NICARAGUAN OCELLATED ANT THRUSH.

Type.—No. 128351, U.S.N.M.; male adult, Escondido River, 50 miles from Bluefields, Nicaragua, August 31, 1892; Charles W. Richmond, collector.

Crown and occiput brown (between clove brown and bister), somewhat lighter on forehead; nape and breast rich dark hazel, passing gradually on underparts into deep orange rufous on center of abdomen, and into mummy brown on sides of body, flanks, and thighs; lower breast, abdomen (except center), and sides of body with subterminal black disks, the feathers mostly with narrow black edgings; under tail-coverts mummy brown, tipped with deep orange rufous, with subterminal black markings. Throat, malar stripe, and sides of neck black, the latter narrowly bordered posteriorly with deep hazel, and connecting the same color of the nape with that of the breast. Back, scapulars, and wing-coverts (except primary coverts), cinnamon, with more or less circular subterminal black spots, those on the back larger than those of the lower parts; rump, upper tail-coverts and lower back mummy brown, with traces of black spots and lighter edgings to the

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feathers on the two latter. Wing feathers blackish brown, pale mummy brown on outer webs, the secondaries edged on the outer webs with buff. Tail black, the outer pair of feathers narrowly tipped with white. Auricular region, lores, and supraorbital line unfeathered, except a small patch of black feathers over eye, and another lesser one on the lower eyelid. Wing, 3.65 inches; tail, 3.45; culmen, 0.83; tarsus, 1.30. "Bill, black; tarsi, feet, and claws, pinkish vinaceous; irides, reddish brown; naked skin on head, azure blue; around ears and along lower jaw, campanula blue."

This species is similar to *P. macleannani* of Panama and Veragua, but is considerably brighter and richer in color on the underparts, back, rump, and wings. The edges of the black-spotted feathers of abdomen, under tail-coverts, back, etc., are similar in color to the surrounding parts, instead of pale, buffy white, as in *P. macleannani*. There seems to be no difference in size between the two forms.

The series examined consists of eleven specimens, five of *P. saturata*, and six of *P. macleannani*. The former are from Nicaragua and Costa Rica, the latter from Veragua and Panama.

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PARTIAL LIST OF BIRDS COLLECTED AT ALTA MIRA, MEXICO, BY MR. FRANK B. ARMSTRONG.

By CHARLES W. RICHMOND,
Assistant Curator of the Department of Birds.

THE BRIEF list here given represents some of the species collected by Mr. Frank B. Armstrong at Alta Mira, a small town not far from Tampico, on the east coast of Mexico. The list is, of course, only fragmentary as regards the total number of species found in this vicinity and contains only those sent to the U. S. National Museum by Mr. Armstrong at intervals during the winter of 1894–95 for identification. Specimens of most of the species were retained for the National Museum collection.

Quite a number of birds previously known only from southern Mexico southward have been recently recorded[1] from Tampico and points north of that place, and in some cases even to the Rio Grande. Mr. Armstrong has forwarded several of these, also some additional species not heretofore mentioned from this part of Mexico, and a few interesting winter records of North American species are included.

The number of specimens mentioned under a species indicates the number sent for identification, and does not give a very correct impression of the abundance or scarcity of a species, as Mr. Armstrong forwarded only a portion of the specimens collected by him.

1. CRYPTURUS MEXICANUS, Salvadori.

MEXICAN TINAMOU.

Three specimens (October and November).

2. COCHLEARIUS ZELEDONI (Ridgway).

CENTRAL AMERICAN BOAT-BILL.

A specimen in fresh plumage (November 15, 1894).

3. ARAMIDES ALBIVENTRIS, Lawrence.

WHITE-THROATED WOOD-HEN.

One specimen.

[1] Salvin and Godman, Ibis, 1889, pp. 232–243; also in Cat. Birds, Brit. Museum.

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4. **JACANA SPINOSA** (Linnæus).

MEXICAN JACANA.

Several specimens (October).

5. **SCARDAFELLA INCA** (Lesson).

INCA DOVE.

Two specimens (October).

6. **GERANOSPIZA NIGRA** (Du Bus).

BLACK FROG HAWK.

Two or three specimens.

7. **MICRASTUR MELANOLEUCUS** (Vieillot).

BLACK AND BUFF MICRASTUR.

One specimen.

8. **URUBITINGA ANTHRACINA** (Lichtenstein).

MEXICAN BLACK HAWK.

One specimen.

9. **RUPORNIS MAGNIROSTRIS GRISEOCAUDA**, Ridgway.

GRAY-TAILED HAWK.

One specimen.

10. **FALCO ALBIGULARIS**, Daudin.

WHITE-THROATED FALCON.

One specimen.

11. **FALCO FUSCO-CÆRULESCENS**, Vieillot.

APLOMADO FALCON.

One specimen.

12. **GLAUCIDIUM PHALÆNOIDES**, Daudin.

FERRUGINOUS PYGMY OWL.

Several specimens.

13. **AMAZONA VIRIDIGENALIS** (Cassin).

CRIMSON-CROWNED PARROT.

One specimen.

14. **AMAZONA AUTUMNALIS** (Linnæus).

AUTUMNAL PARROT.

Several specimens.

15. **CONURUS ASTEC**, Souancé.

AZTEC PARAKEET.

Several specimens.

16. **PIAYA CAYANA THERMOPHILA** (Sclater).

CENTRAL AMERICAN SQUIRREL CUCKOO.

One specimen (February 15).

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17. **COCCYZUS MINOR** (Gmelin).

MANGROVE CUCKOO.

One specimen.

18. **TROGON AMBIGUUS**, Gould.

COPPERY-TAILED TROGON.

Several specimens.

19. **TROGON MELANOCEPHALUS**, Gould.

BLACK-HEADED TROGON.

Several specimens.

20. **CERYLE TORQUATA** (Linnæus).

RINGED KINGFISHER.

One specimen.

21. **CAMPEPHILUS GUATEMALENSIS** (Hartlaub).

GUATEMALAN IVORY-BILL.

One specimen.

22. **CEOPHLŒUS SCAPULARIS** (Vigors).

DELATTRE'S WOODPECKER.

One specimen.

23. **CHLORONERPES ÆRUGINOSUS**, Lichtenstein.

MEXICAN GREEN WOODPECKER.

Several specimens.

24. **CHLOROSTILBON CANIVETI** (Lesson).

CANIVET'S EMERALD.

Two specimens.

25. **PLATYPSARIS AGLAIÆ** (Lafresnaye).

ROSE-THROATED BECARD.

Several specimens.

26. **TITYRA PERSONATA** (Jardine and Selby).

MASKED TITYRA.

One specimen.

27. **TYRANNUS MELANCHOLICUS COUCHI** (Baird).

COUCH'S KINGBIRD.

One specimen.

28. **PITANGUS DERBIANUS** (Kaup).

DERBY FLYCATCHER; KISKADEE.

Several specimens.

29. **MYIOZETETES TEXENSIS** (Giraud.)

GIRAUD'S FLYCATCHER; LITTLE KISKADEE.

Several specimens.

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30. **MEGARHYNCHUS PITANGUA** (Linnæus).

BROAD-BILLED KISKADEE.

One specimen.

31. **MYIARCHUS LAWRENCEII** (Giraud).

LAWRENCE'S FLYCATCHER.

One specimen.

32. **ORNITHION IMBERBE** (Sclater).

BEARDLESS FLYCATCHER.

Two specimens (January 18, 1895).

33. **THAMNOPHILUS DOLIATUS MEXICANUS**, Allen.

MEXICAN ANT THRUSH.

One specimen.

34. **DENDRORNIS FLAVIGASTER** (Swainson).

IVORY-BILLED WOODHEWER.

Twenty some specimens.

35. **PSILORHINUS MORIO** (Wagler).

BROWN JAY.

One specimen.

36. **CORVUS MEXICANUS**, Gmelin.

MEXICAN CROW.

Two specimens.

37. **GYMNOSTINOPS MONTEZUMÆ** (Lesson).

MONTEZUMA YELLOW-TAIL.

One specimen.

38. **AMBLYCERCUS HOLOSERICEUS** (Lichtenstein).

PLANTATION CASSIQUE.

Several specimens.

39. **ICTERUS GULARIS** (Wagler).

LESSON'S ORIOLE.

Several specimens.

40. **SPINUS PSALTRIA MEXICANUS** (Swainson).

MEXICAN GOLDFINCH.

Two specimens.

41. **PASSERINA PARELLINA** (Bonaparte).

BLUE BUNTING.

Several specimens.

42. **EUETHEIA OLIVACEA PUSILLA** (Swainson).

MEXICAN GRASSQUIT.

Several specimens.

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43. **PITYLUS CELÆNO** (Lichtenstein).

MEXICAN PITYLUS.

Twelve or more specimens.

44. **SALTATOR ATRICEPS**, Lesson.

BLACK-HEADED SALTATOR.

Four specimens.

45. **SALTATOR GRANDIS** (Lichtenstein).

GRAY-BACKED SALTATOR.

One immature male (February 22).

46. **PHŒNICOTHRAUPIS FUSCICAUDA SALVINI** (Berlepsch).

SALVIN'S ANT TANAGER.

Two specimens.

47. **PIRANGA LUDOVICIANA** (Wilson).

LOUISIANA TANAGER.

Numerous specimens (January and February). Some of them molting.

48. **TANAGRA ABBAS**, Lichtenstein.

NORTHERN PALM TANAGER.

Two specimens (February 23), not different from Guatemalan birds.

49. **EUPHONIA HIRUNDINACEA**, Bonaparte.

SWALLOW-BILLED EUPHONIA.

Several specimens.

50. **EUPHONIA AFFINIS**, Lesson.

ALLIED EUPHONIA.

Numerous specimens.

51. **VIREO SOLITARIUS** (Wilson)

BLUE-HEADED VIREO.

One specimen (October).

52. **HELMITHEROS VERMIVORUS** (Gmelin).

WORM-EATING WARBLER.

One specimen (January 26).

53. **COMPSOTHLYPIS AMERICANA** (Linnæus).

PARULA WARBLER.

One specimen (February 16).

54. **GEOTHLYPIS FLAVOVELATUS**, Ridgway.

ALTA MIRA YELLOW-THROAT.

Geothlypis flavorelatus, RIDGWAY, Proc. U. S. Nat. Mus., XVIII, p. 119.

One adult male (December 5, 1894).

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55. **SYLVANIA MITRATA** (Gmelin).

HOODED WARBLER.

One specimen (November 20).

56. **SYLVANIA PUSILLA** (Wilson).

WILSON'S WARBLER.

Several specimens.

57. **BASILEUTERUS CULICIVORUS** (Lichtenstein).

BRASHER'S WARBLER.

Several specimens.

58. **THRYOTHORUS MACULIPECTUS**, Lafresnaye.

SPOTTED-BREASTED WREN.

Two or three specimens.

59. **HEMIURA LEUCOGASTRA** (Gould).

SHORT-TAILED WREN.

Uropsila leucogaster, SCLATER and SALVIN, Nomencl. Av. Neotr., 1873, p. 155.
Hemiura [*leucogastra*], RIDGWAY, Proc. U. S. Nat. Mus., X, 1887, p. 511.

One specimen (February 10).

60. **MERULA GRAYI** (Bonaparte).

GRAY'S ROBIN.

One specimen.

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ON SOME REARED PARASITIC HYMENOPTEROUS INSECTS FROM CEYLON.

By L. O. Howard, Ph. D.
Honorary Curator of Insects,
and
Wm. H. Ashmead,
Custodian of the Hymenoptera.

Mr. E. Ernest Green, of Pundaloya, Ceylon, has long been studying the Coccidæ of that interesting region, and has in preparation a large work in parts entitled The Coccidæ of Ceylon.[1] In the course of his studies of the Coccidæ, he has reared certain hymenopterous parasites from them. These he has sent to the U. S. National Museum for names, sending with them a few parasites of lepidopterous larvæ which he has incidentally reared.

The parasitic Hymenoptera of Ceylon are not well known. A few species have been described by Walker and a number of others by Motschulsky. It is not surprising, therefore, that the majority of the species sent by Mr. Green proved to be new, and the material is of additional interest for the reason that in every case the parasite is associated with its host insect. The most striking feature of the sending is the number of parasites reared from one of the lac insects—*Tachardia albizziæ*. It will be interesting to state that Mr. Green has found several other insects associated with this economically important Coccid, among them a Phlœothrips which feeds on the excretion of the bark-louse, and a Tineid larva which preys upon the Coccid itself.

Of the insects here reported upon, Dr. Howard has studied the Chalcididæ and Mymaridæ and Mr. Ashmead the Ichneumonidæ and Braconidæ.

Family CHALCIDIDÆ.

Subfamily APHELININÆ.

Genus COCCOPHAGUS, Westwood.

Coccophagus, Westwood, Phil. Mag., III, 1833.

COCCOPHAGUS ORIENTALIS, new species (Howard).

Female.—Length, 1.2 mm.; expanse, 2.5 mm. Antennæ with scape somewhat flattened from side, appearing from this view large and heavy; bulla distinct, strongly notched from below, scape equal in

[1] Shortly to be published by Dulau & Co., of London.

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length to pedicel and first two funicle joints, pedicel a little longer than wide, triangular, first funicle joint longer than pedicel and longer than second funicle joint, second and third joints each successively shorter, but all of the same width, as also the two basal joints of club; the longitudinal elevations of funicle joints and club very strong and numerous, funicle joints with stout bristles in addition. Head and thorax with short and rather close black hairs, very faintly shagreened, but shining; hind thighs somewhat thickened, spur of middle tibiæ unusually long but slender. General color black with strong purplish reflections; all tarsi nearly white, tips of front and middle tibiæ also whitish, middle tibial spur white; fore wings infuscated to stigma, nearly hyaline at extreme base, tip perfectly hyaline.

Type.—No. 3248, U.S.N.M. Thirteen specimens, reared by E. Ernest Green, Punduloya, Ceylon, from *Ceroplastes actiniformis*, *Lecanium viride*, *Lecanium coffeæ*, and *Dactylopius adonidum*. Seems to be an abundant and general scale insect parasite in Ceylon.

Differs radically from all other species of *Coccophagus* known to me with the exception of *C. purpureus*, Ashmead, described from a specimen captured in Florida. The description of the latter species is short, but the wings are said to be entirely fuscous. In color, in the presence of more or less infuscation of the wings, and in the absence of a scutellar spot, the two forms agree.

COCCOPHAGUS FLAVESCENS, new species (Howard).

Female.—Length, 1.2 mm.; expanse, 2.6 mm. Eyes hairy, well separated, ocelli forming a right-angled triangle; antennæ long, scape reaching nearly to tip of head; first funicle joint twice as long as pedicel and three times as long as wide; second funicle joint two-thirds as long as first, and three-fourths as long as second; all subequal in width. Club not swollen, as long as two preceding funicle joints together. Thorax well rounded and furnished with sparse, rather long, brown pile; the two apical bristles of the mesoscutellum long, white, each arising from a minute black spot. General surface almost smooth; no shagreening can be discovered. General color dark honey yellow; antennæ brownish, a little lighter at joints; dorsal surface of abdomen dusky; the fore wings slightly infuscated.

Male.—What is apparently the male of this species differs radically in color from the female, but in no other important particulars. It is uniformly black with the exception of the tarsi and the tips of middle tibiæ, which are dirty white.

Types.—No. 3249, U.S.N.M.; four female and three male specimens reared from *Lecanium coffeæ*, by E. Ernest Green, Punduloya, Ceylon.

Genus PHYSCUS, Howard.

Physcus, Howard, Revis. Aphelininæ N. A., Techn. Ser. No. 1, U. S. Dept. Agric., Div. Entom., 1895, p. 43.

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PHYSCUS VARICORNIS, Howard.

Coccophagus varicornis, HOWARD, Ann. Rep. U. S. Dept. Agric., 1880, p. 360.
Physcus varicornis, HOWARD, Revis. Aphelininæ N. A., Techn. Ser. No. 1, U. S. Dept. Agric., Div. Entom., 1895, p. 43.

This species, hitherto found only at Washington, District of Columbia; Alameda, California, and Champaign, Illinois, at which points it has been reared respectively from *Aspidiotus ancylus*, *Chionaspis quercus*, and *Chionaspis americana*, has been reared by Mr. Green in Ceylon from *Chionaspis eleagni*.

Genus ASPIDIOTIPHAGUS, Howard.

Aspidiotiphagus, HOWARD, Insect Life, VI, 1894, p. 230.

ASPIDIOTIPHAGUS CITRINUS, (Craw).

Coccophagus citrinus, CRAW, Destructive Insects, Sacramento, California, 1891.
Aspidiotiphagus citrinus, HOWARD, Insect Life, VI, 1891, p. 231.

This common and widespread parasite of armored scales in the United States and southern Europe was reared by Mr. Green from *Diaspis lanatus*.

Genus APHELINUS, Dalman.

Aphelinus, DALMAN, Svensk. Akad. Handl., p. 181, 1820.

APHELINUS MYTILASPIDIS, LeBaron.

Aphelinus mytilaspidis, LEBARON, Amer. Ent., II, 1870, p. 360.

This species, commonly reared in the United States from *Mytilaspis pomorum*, *Chionaspis pinifolii*, and *Diaspis carueli*, has been reared by Mr. Green from *Chionaspis permutans* and *Chionaspis graminis*.

Genus ENCARSIA, Fœrster.

Encarsia, FŒRSTER, Kleine Monographien, 1878, pp. 65–66.

The two species which follow differ in some degree from the species described under this genus in the writer's "Revision of the Aphelininæ of North America," but the assemblage of characters brings them so close to *Encarsia* that it is not considered advisable to erect a new genus for them.

ENCARSIA PLANCHONIÆ, new species (Howard).

Female.—Length, 0.56 mm.; expanse, 1.16 mm. Funicle joint 1 as long as pedicel; joint 2 considerably longer than 1, and with 3, 4, and 5, subequal in length and breadth; the two terminal joints not so closely united as with other species of this genus, the first one equaling the fourth funicle joint in length and breadth, and the last one pointed at apex and somewhat shorter. All funicle joints with close longitudinal carinæ, as with *Coccophagus*. Cephalic border of meso-

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scutellum convex, stigmal vein of fore wings short and nearly parallel with costa, marginal vein with five bristles on costal border, these bristles shorter than costal bristles which begin at end of marginal. Hind wings with a single row of discal cilia on apical fourth, this row near costal margin of wing.

General color golden yellow, eyes dark, ocelli reddish, abdomen more or less suffused with brown, joints between segments accentuated, mesoscutum brownish; legs and antennæ lighter in color than body.

Type.—No. 3250, U.S.N.M.; two female specimens reared by E. Ernest Green, Punduloya, Ceylon, from *Planchonia delicata.*

ENCARSIA AONIDIÆ, new species (Howard).

Female.—Length, 0.51 mm.; expanse, 1.14 mm. Funicle joint 1 much longer than pedicel, the following joints subequal in length, the terminal joint as with preceding species. Funicle with sparser longitudinal carinæ, but two observable from dorsal aspect. Funicle and club clothed with sparse, short, nearly erect bristles—an unique character among the Aphelininæ. Cephalic border of mesoscutellum not convex, straight in one specimen and with two slight reentering angles in the other. Stigmal vein of fore wings as with preceding species; marginal vein with nine bristles on costal border, these bristles longer than costal cilia beginning at end of marginal. Hind wings on outer fourth with two rows of discal cilia, one row near costal margin and the other near hind margin.

Color as with preceding species, except that the abdomen is darker.

Type.—No. 3251, U.S.N.M.; two female specimens reared by E. Ernest Green, Punduloya, Ceylon, from *Aonidia corniger.*

Subfamily ENCYRTINÆ.

Genus ENCYRTUS, Latreille.

Encyrtus, LATREILLE, Gen. Crust. et Ins., IV, p. 31, 1809.

ENCYRTUS FLAVUS, Howard.

Encyrtus flavus, HOWARD, Ann. Rep. Dept. Agric., 1880, p. 367.

This species was first found at Los Angeles, California, where it is parasitic upon *Lecanium hesperidum.* Some years later it was reared at Columbus, Ohio, on the same scale on greenhouse plants. Mr. Green has reared it from *Lecanium piperis.*

ENCYRTUS LICHTENSIÆ, new species (Howard).

Female.—Length, 3.3 mm.; expanse, 5.4 mm. Rather closely related to the European *E. cyanifrons*, Dalman. Antennal scape rather strongly widened below; pedicel somewhat longer than first funicle joint; first funicle joint one-half longer than wide, succeeding funicle joints increasing slightly in width but subequal in length; club flattened, as long as two preceding funicle joints together, broader from

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side, somewhat truncate, attenuate from above. Head rather triangular from side, eyes proximate, naked, ocelli forming an acute-angled triangle. Mesoscutum with sparse, rather fine punctures, very delicately shagreened, shining; mesoscutellum more coarsely shagreened, without punctures and with a few long hairs at tip, not forming a tuft. Marginal vein short, stigmal and postmarginal long. General color metallic blue-green, mesoscutum somewhat coppery. Pronotum, head, tegulæ, and legs dark honey yellow; mesopleura brown; antennal scape and club black, scape brownish near tip; pedicel and funicle joints 1 to 4 infuscated, 5 and 6 white; fore wings almost uniformly infuscated, lighter at base and tip.

Type.—No. 3252, U.S.N.M. Five female specimens reared from *Lichtensia koebelei* by E. Ernest Green, Punduloya, Ceylon.

ENCYRTUS CHIONASPIDIS, new species (Howard).

Female.—Length, 1.2 mm.; expanse, 2 mm. Antennæ inserted near mouth, scape slender, pedicel as long as three succeeding funicle joints together; funicle joints 1 to 4 subequal in length but increasing in width; joint 5 twice as long as 4, joint 6 longer than 5 but about as wide. Club swollen at base, pointed at tip, nearly as long as entire funicle. Head with protruding front, eyes well separated, ocelli forming an obtuse-angled triangle; thorax flat, the wide axillæ meeting at tips; ovipositor slightly protruding. General surface glistening, punctation almost imperceptible. Abdomen as long as thorax, subovate, acute at tip; marginal, postmarginal, and stigmal veins subequal in length. General color black, with metallic reflections; antennæ brown, all legs except coxæ pallid; wings hyaline.

Type.—No. 3253, U.S.N.M. Four female specimens reared from *Chionaspis graminis* by E. Ernest Green, Punduloya, Ceylon.

ENCYRTUS PLANCHONIÆ, new species (Howard.)

Female.—Length, 1.2 mm.; expanse, 2.8 mm. Body short, stout; thorax nearly plane above; head elongate, subtriangular, when seen from above; eyes nearly as much dorsal as lateral; ocelli forming an acute-angled triangle. Scape inserted near middle of face, slender; pedicel minute; funicle joints as wide as long, club ovate, a little longer than two preceding antennal joints together. Scapulæ meeting at tips; mesonotum smooth, slightly glistening, submarginal vein short. General color honey-yellow; anterior edge of mesoscutum dark and slightly metallic; sides of mesoscutum and tip of abdomen concolorous with this.

Type.—No. 3254, U.S.N.M. One female specimen reared from *Planchonia delicata* by E. Ernest Green, Punduloya, Ceylon.

ENCYRTUS TACHARDIÆ, new species (Howard).

Male.—Length, 1.5 mm.; expanse, 3.6 mm. Body stout, thorax well rounded, axillæ meeting at tip; antennæ inserted at middle of face,

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scape not widened; funicle joints subcylindrical, well separated, each with regular, close-set hairs not separated into whorls and not especially long; eyes distant, marginal vein very short, postmarginal and stigmal subequal; mesonotum very finely shagreened, shining. General color metallic blue-green, scutellum with coppery reflections, outer edge of mesoscutum brownish, all legs, tegulæ, and mesopleura concolorous, tibiæ a little darker, antennæ dark brown, scape and pedicel blackish above, wings hyaline, veins dark brown.

Type.—No. 3255, U.S.N.M. Two male specimens reared from *Tachardia albizziæ* by E. Ernest Green, Punduloya, Ceylon.

It is undesirable to describe species of Encyrtinæ from the male sex alone, but on account of the economic importance of the host insect the writer has considered it advisable to give this insect a name.

ENCYRTUS SOLIDUS, new species (Howard).

Male.—Length, 1.5 mm.; expanse, 3.4 mm. Form robust, compact; abdomen short, triangular, somewhat compressed from sides; axillæ separated at tips; antennæ inserted slightly below middle of face, scape short, not widened, funicle joints thick and closely united, pubescence extremely short and very dense; joints 2 to 5 subequal in length, joint 5 rather shorter, joint 1 considerably longer; club short, less than four and five in length. Head faintly granulate, mesonotum faintly shagreened. General color black, faintly glistening; antennal scape brownish, pedicel nearly black; flagellum light brown; all coxæ and femora nearly black, the femora lighter at tips; front and hind tibiæ brown, yellowish at tips; middle tibiæ light yellowish-brown; tegulæ brownish; wings hyaline, wing veins dark brown; marginal vein thickened, nearly black.

Type.—No. 3256, U.S.N.M. One male specimen reared from *Eriococcus rhodomyrti* by E. Ernest Green, Punduloya, Ceylon.

ANAGYRUS, new genus (Howard).

Female.—Mandibles bidentate; antennæ inserted below middle of face, scape greatly widened below; flagellum slender, cylindrical; pedicel cylindrical, shorter than first funicle joint; funicle joints 1 to 6 subequal in length and width, each one-half longer than pedicel; club somewhat flattened laterally, oval, not quite as long as two preceding funicle joints; eyes distant, faintly hairy, ocelli forming a right-angled triangle; head and mesonotum opaque; scapulæ slightly separated at tips; wings with extremely short marginal cilia; marginal vein very short; stigmal moderately long, slightly curved; postmarginal very short; ovipositor slightly protruded.

Male.—Antennal scape moderately swollen; pedicel triangular, nearly as wide as long; funicle joints with moderately long, rather thick, pubescence, not growing in whorls; joints subcylindrical, attached to each other at lower border; joint 1 longest, four times as long as

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pedicel; remaining joints gradually decreasing in length; axillæ meeting at tips; genitalia half as long as abdomen.

Resembles in many respects *Euscapus*, Dahlbom (=*Dinocarsis*, Fœrster); but differs in position of ocelli, in the unlengthened stigmal vein, in the somewhat smaller but not expanded male scape, and in other lesser details.

ANAGYRUS GREENI, new species (Howard).

Female.—Length, 2 mm.; expanse, 4.1 mm. Head and mesonotum strongly shagreened and furnished with very short, close pile; mesopleura with a distinct longitudinal striation. General color dull reddish-yellow; scape black, whitish at tip; pedicel black, whitish at tip; first funicle joint black, remaining funicle joints and club silvery white; club with a yellowish shade at tip; cheeks behind eyes black; mandibles black at tip; metanotum and abdomen dusky or nearly black; legs pallid; wings hyaline.

Male.—Resembles female in sculpturing. Color black; mesopleura dark fuscous; legs a little darker than female.

Types.—No. 3257, U.S.N.M. Five females and four males, reared from *Maskellia zonata* by E. Ernest Green, Pundaloya, Ceylon.

ANICETUS, new genus (Howard).

Female.—Belongs to the group of genera characterized by enormous laterally developed antennæ, viz, *Cerapterocerus*, *Eusemion*, *Mira*, *Anusia*, and *Rileya*. Eyes dorsal, rather close together, ocelli at the angles of a right-angled triangle; face strongly concave, with a very marked transverse dorsally arched carina at front of eyes; antennal scape reaches frontal arch, gradually widened and exfoliated, inserted slightly below middle of face; the six funicle joints all short and rapidly widening from the narrow pedicel, all subequal in length and all together shorter than club; club itself obliquely truncate from tip to base; eyes hairy; mesonotum slightly rounded; axillæ narrow, meeting at tips; ovipositor just showing; wings nearly uniformly cloudy; marginal vein shorter than stigmal, somewhat thickened; the cilia below bend of submarginal vein longer than elsewhere; all tarsi short and rather stout; spur of middle tibiæ stout and a trifle longer than first tarsal joint.

ANICETUS CEYLONENSIS, new species (Howard).

Female.—Length, 1.8 mm; expanse, 4 mm. Face below carina densely shagreened, with a well-rounded longitudinal intra-antennal carina; antennal scape faintly shagreened, with faint brownish pile; mesonotum very delicately shagreened, somewhat lustrous, especially on mesoscutum; pile faint and brownish. General color dark honey-yellow, with faint purplish luster on mesoscutum, vertex, and sides of first segment of abdomen. Antennæ brownish toward tip, middle and hind tibiæ with a dark-brown dot on outer middle and another at base; first tarsal joint of hind legs brownish; middle tibiæ with distinct bristles

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on outer margin; spiracular hairs of third abdominal segment long and distinct.

Type.—No. 3258, U.S.N.M. One female specimen reared from *Vinsonia stellifera*, Punduloya, Ceylon, by E. Ernest Green.

Genus COMYS, Fœrster.

Comys, FŒRSTER, Hymenop. Stud., II, 1856, p. 144.

COMYS RUFESCENS (Motschulsky).

Chiloneurus rufescens, MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc., XXXVI, 1863, p. 53.

This is the only one of the Motschulsky species recognized. The Russian author's specimens were taken by Nietner on the summit of Mount Patannas, and those received from Mr. Green were reared by him from *Lecanium coffeæ*.

Genus HOMALOPODA, Howard.

Homalopoda, HOWARD, Journ. Linn. Soc. Zool., XXV, 1894, p. 90.

HOMALOPODA CRISTATA, Howard.

Homalopoda cristata, HOWARD, Journ. Linn. Soc. Zool., XXV, 1894, p. 91.

The type specimens of this monotypical genus were collected by Mr. H. H. Smith on the Island of St. Vincent, British West Indies. A single female was received from Mr. Green, reared from *Aspidiotus secretus*. The insect has an Asiatic facies and may have been carried to the West Indies from the East Indies under scale insects on certain plants which were being imported.

Genus APHYCUS, Mayr.

Aphycus, MAYR, Verh. k. k. zool.-bot. Gesellsch. Wien, 1875, p. 695.

APHYCUS LICHTENSIÆ, new species (Howard).

Female.—Length, 1.3 mm.; expanse, 3 mm. General color reddish yellow; abdomen black, antennal scape black, whitish at tip; pedicel black, white at tip; funicle joints 1 to 4 black, fourth whitish above, 5 and 6 yellowish-white; club black; metascutellum blackish, tegulæ dark at tip, mesoscutum with two curved transverse narrow black lines, one on each side, reaching nearly to middle; all tibiæ with three black bands more or less interrupted. Antennal scape moderately widened below; pedicel twice as long as wide, as long as three first funicle joints together; funicle joints gradually increasing in width from 1 to 4; 5 and 6 suddenly wider and longer. Club flattened, obliquely truncate, as long as funicle joints 5 and 6 together.

Type.—No. 3259, U.S.N.M. Eight female specimens reared from *Lichtensia koebelei* by E. Ernest Green, Punduloya, Ceylon.

Genus ARRHENOPHAGUS, Aurivillius.

Arrhenophagus, AURIVILLIUS, Ent. Tidsk. IX, 1888, pp. 144–145.

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ARRHENOPHAGUS CHIONASPIDIS, Aurivillius.

Arrhenophagus chionaspidis, AURIVILLIUS, Ent. Tidsk. IX, 1888, p. 146.

This remarkable encyrtine, reared by Aurivillius in Sweden from *Chionaspis salicis*, has been reared in the United States from *Diaspis rosæ* at Kirkwood, Missouri, by Miss M. E. Murtfeldt, and from the same host at Champaign, Illinois, by Mr. W. G. Johnson. Mr. Green reared it in Ceylon from *Fiorinia saprosomæ*.

Subfamily EUPELMINÆ.

Genus ANASTATUS, Motschulsky.

Anastatus, MOTSCHULSKY, Étud. entom., 8th ann., 1859, p. 116.
Antigaster, WALSH, Amer. Ent., II, 368 (1870).

ANASTATUS TACHARDIÆ, new species (Howard).

Male.—Length, 1.5 mm. Dark blue or blue-black; mandibles, tips of palpi, sutures of trochanters, tips of anterior tibiæ, and their tarsi, except last joint, pale; basal joint of hind tarsi and tibial spurs white; abdomen beneath piceous, with the sutures 1 and 2 whitish. Head and thorax above finely shagreened; antennæ filiform, pubescent, the flagellum brown-black, the funicle joints subequal, a little longer than thick, 4, 5, and 6 somewhat shorter than 1, 2, and 3, the scape short, not extending to middle ocellus, blue-black, pedicel rounded, blue-black. Thorax with complete, but not sharply defined, parapsidal grooves. Wings hyaline, the veins brown, the marginal vein as long as the submarginal, the stigmal and postmarginal veins short, equal in length, the stigmal slightly curved, ending in a short knob. Abdomen oblong, as long as the thorax.

Habitat.—Punduloya, Ceylon.

Type.—No. 3260, U.S.N.M. One male specimen, supposed by Mr. E. Ernest Green to have been reared from *Tachardia albizziæ*.

For the suggestion as to the synonymy of Walsh's genus *Antigaster* with *Anastatus* the writer is indebted to Mr. Ashmead.

Subfamily ELACHISTINÆ.

Genus EUPLECTRUS, Westwood.

Euplectrus, WESTWOOD, Lond. Edin. Phil. Mag., I, 1832, p. 128.

EUPLECTRUS CEYLONENSIS, new species (Howard).

Female.—Length, 2.8 mm.; expanse, 6.3 mm. Resembles closely *E. furnius*, Walker (British West Indies). Stout, shining, bristly; pedicel of antennæ with a pair of long, stout bristles at base, and another pair, longer and stouter, at tip; mesonotum strongly shagreened, with two strong elongate longitudinal depressions just anterior to tip of scutellum; axillæ with strong and very broad depressions at articulation with scutellum; scutellum nearly smooth, very faintly aciculate; nearly all of thoracic bristles whitish, the pair next the tegulæ black.

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Color black; antennal scape and pedicel honey-yellow, flagellum brown; tegulæ and mouth parts and all legs, including coxæ, honey-yellow; a large honey-yellow spot on venter of abdomen; indications of a corresponding dorsal spot, which is fainter in some specimens than in others; wings hyaline. The male does not differ, except sexually, from the female.

Differs from *E. furnius* mainly in the more pronounced sculpturing of the mesonotum, in the greater size and depth of the notal impressions, and in the greater length and strength of the bristles.

Types.—No. 3261, U.S.N.M. Many male and female specimens reared from the larva of *Euproctis fraterna* by E. Ernest Green, Punduloya, Ceylon.

Subfamily ENTEDONINÆ.

Genus HOLCOPELTE, Förster.

Holcopelte, FÖRSTER, Hymen. Stud., II, 78, 1856.

A species of this genus, in almost unrecognizable condition, labeled as having been reared from *Tachardia albizziæ*, was among the parasites received. All of the species of this genus are hyperparasites, and this species may have for its host one of the foregoing insects described as parasitic upon *Tachardia*.

Subfamily TETRASTICHINÆ.

Genus TETRASTICHUS, Haliday.

Tetrastichus, HALIDAY, Trans. Ent. Soc. Lond., III, 297, 1843.

Several specimens of an unrecognizable species of this genus were also found in this collection, also labeled as having been reared from *Tachardia albizziæ*. The species of this genus are also hyperparasites without exception, so far as known, and the true host of Mr. Green's forms to be found among the larger parasites which he reared from the lac insect.

Family MYMARIDÆ.

Admitting family rank for this interesting group of extremely minute parasitic Hymenoptera, as originally proposed by Haliday and later adopted by Ashmead, it is deemed advisable at the present time to establish two subfamilies, the first of which, called the Mymarinæ, including those forms which have 4-jointed tarsi, will contain the genera *Mymar*, *Eustochus*, *Doriclytus*, *Cosmocoma*, *Caraphractus*, *Stictothrix*, *Anaphes*, *Anagrus*, and *Polynema*; while the second, which may be called the Gonatocerinæ, and contains those forms which have 5-jointed tarsi, will include the genera *Gonatocerus*, *Camptoptera*, *Ooctonus*, *Limacis*, *Alaptus*, and *Litus*.

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Subfamily MYMARINÆ.

ANTHEMUS, new genus (Howard).

Male.—Antennæ, 9-jointed; scape and bulla plainly differentiated, pedicel longer and broader than first funicle joint; funicle joints subequal in length and breadth, about twice as long as broad, each with a single whorl of very long hairs. Club attenuate at tip, as long as three preceding funicle joints together, undivided, and furnished with long hairs like the funicle joints—the hairs, however, being irregularly placed. Eyes distant, naked; ocelli large, placed in a nearly straight line; abdomen sessile, tarsi 4-jointed, wings as with *Anagyrus*.

Female.—Antennæ 8-jointed, pedicel swollen, two and a half times as long as wide, first funicle joint one-third as long as pedicel, much narrower, subcylindrical; second, third, fourth, and fifth funicle joints increasing gradually in length and width; club long ovate, longer than three preceding funicle joints together, slightly wider than fifth funicle joint, undivided; funicle and club with very sparse and short hairs; ovipositor slightly extruded; in other respects resembles male.

ANTHEMUS CHIONASPIDIS, new species (Howard).

Male and female.—Length, 0.536 mm.; expanse to tip of wings, 1.35 mm.; expanse to tips of cilia, 1.72 mm. General color yellow brown; darker at sides and base of abdomen and at sides of metanotum; eyes dark purple, ocelli lighter, reddish. Legs honey-yellow, hind femora darker. Funicle joints of male antennæ somewhat flask-shaped, the swelling of each joint at the insertion of the whorl of hairs giving a slightly constricted appearance to the distal half of the joint; hind wings with no discal cilia, except a single row of about six, extending from the end of the vein halfway to tip of wing; discal cilia of fore wings dense and strong.

Types.—No. 3262, U.S.N.M. Many male and female specimens reared by E. Ernest Green, Punduloya, Ceylon, from *Chionaspis graminis*.

Subfamily GONATOCERINÆ.

Genus LITUS, Haliday.

Litus, HALIDAY, Ent. Mag., I, 269, 1833.

LITUS ENOCKI, new species (Howard).

Female.—Length, 0.279 mm.; expanse to tip of wings, 0.79 mm.; expanse to tips of cilia 1.02 mm. Scape and pedicel swollen, funicle joints attenuate, first and second subequal in length, each about as long as pedicel; third and fourth a little shorter, fifth and sixth still shorter, slightly swollen; club longer than three preceding joints together, slightly broader, elongate ovate in shape. Color dark brown, legs, antennal scape, and pedicel lighter, abdomen lighter near base

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below. Wings faintly infuscated, especially near base. Body stout, compact, abdomen sessile, thorax rather strongly arched.

Type.—No. 3263, U.S.N.M. Two female specimens reared by Mr. E. Ernest Green, Punduloya, Ceylon, from *Eriococcus*. Named for Mr. Fred. Enock, of London, who has devoted considerable attention to the Mymaridæ and has made the most beautiful slide mounts of these minute creatures which I have seen.

Family ICHNEUMONIDÆ.

Subfamily OPHIONINÆ.

Genus CHAROPS, Holmgren.

Charops, HOLMGREN, Svensk. Akad. Handl., 1858, n. 8, 39.

CHAROPS ERYTHROGASTER, new species (Ashmead).

Female.—Length, 6.5 mm. Head, thorax, and antennæ, except scape beneath, black, clothed with a fine grayish pubescence; scape beneath, legs, except middle and hind coxæ, and abdomen, except petiole, rufous; middle and hind coxæ and petiole black, first joint of hind trochanters, extreme base of hind femora, and tarsi more or less dusky; mandibles, palpi, and tegulæ whitish. The head, antero-posteriorly, is thin, with the vertex acute; eyes subreniform; antennæ filiform, extending to the second abdominal segment, with several of the ante-penultimate joints transverse, about three times wider than long. Thorax short ovate, closely, opaquely punctate, without parapsidal furrows, the metathorax abrupt, without carinæ, the spiracles oval. Wings hyaline, the veins brown-black, the stigma narrow, lanceolate, the third discoidal cell longer than the first, the second recurrent nervure joining the cubitus behind the transverse cubital nervure. Abdomen, with the petiole, twice as long as the thorax, compressed, the petiole as long as the middle femur, the body of abdomen more than twice as long as the petiole, the ovipositor hardly projecting, with black sheaths.

Male.—Length, 6 mm. Agrees with the female, except that all coxæ are black, the middle legs are more or less piceous, the hind legs black, while the abdomen, except the ventral membranous part, is entirely black.

Habitat.—Punduloya, Ceylon.

Type.—No. 3264, U.S.N.M. One female and one male, bred by Mr. E. Ernest Green, from the larva of *Euterota*, sp.

Subfamily CRYPTINÆ.

Genus HEMITELES, Gravenhorst.

Hemiteles, GRAVENHORST, Ichn. Eur., II, p. 780, 1829.

HEMITELES BRACHYCYTTARI, new species (Ashmead).

Female.—Length, 5 mm.; ovipositor about one third the length of abdomen. Head and thorax black, minutely, closely punctate; clypeus polished, impunctate; mandibles, palpi, annulus on antennæ, superior

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margin of scape, anterior and middle coxæ, annulus at base of hind tibiæ, and the apical margins of first, second, third, fourth, and sixth segments of abdomen white; rest of legs, except hind tibiæ and tarsi, reddish yellow. Head with the occiput concave, polished, the eyes very large, occupying the whole side of the head; antennæ very slightly thickened toward apex, 26-jointed, the flagellar joints 1 to 3 long, cylindrical, subequal, the fourth about two-thirds as long as the third, the fifth and beyond gradually becoming shorter and shorter so that the terminal joints are not longer than wide. Thorax with parapsidal grooves, the metathorax areolated but with the lateral longitudinal carinæ wanting. Abdomen, except petiole and the apical margins of segments, as before mentioned, black, the petiole, except the white apical margin, reddish yellow, the second and third segments, except the white apical bands, are closely, opaquely shagreened, while the petiole and the rest of the segments are smooth and shining.

Habitat.—Punduloya, Ceylon.

Type.—No. 3265, U.S.N.M. One female, reared by Mr. E. Ernest Green from the larva of *Brachycyttarus subteralbatus*, Hampson.

Subfamily PIMPLINÆ.

Genus POLYSPHINCTA, Gravenhorst.

Polysphincta, GRAVENHORST, Hymen. Eur., III, 1829, p. 112.

POLYSPHINCTA CEYLONICA, new species (Ashmead).

Female.—Length, 4 mm. Polished black; scape beneath, mesopleura and scutellum red; mandibles, palpi, tegulæ, and legs, except a spot at apex of hind tibiæ, and hind tarsi, except first joint toward base, which are fuscous, white. Wings hyaline, the stigma and veins brown. Metanotum with two median carinæ.

Habitat.—Punduloya, Ceylon.

Type.—No. 3266, U.S.N.M. One female, reared by Mr. E. Ernest Green from an unknown spider.

Family BRACONIDÆ.

Subfamily BRACONINÆ.

Genus BRACON, Fabricius.

Bracon, FABRICIUS, Syst. Piez., p. 102, 1804.

BRACON GREENI, new species (Ashmead).

Female.—Length, 2.5 to 3 mm.; ovipositor two-thirds length of abdomen. Brownish-yellow; disk of metathorax, extreme apex of second abdominal segment and large dorsal blotches on third and fourth segments black. Head and thorax subopaque, almost smooth; antennæ 24-jointed, brown-black, and nearly as long as the body. Wings hyaline, the stigma and veins brown, the second branch of the radius

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about three times as long as the first, the second submarginal cell being a little longer than the first; the recurrent nervure joins the first submarginal cell a little beyond its apical third. Abdomen broadly ovate and shagreened, the segments 2 to 4 subequal, the following a little shorter.

Male.—Length, 2 to 2.5 mm. Agrees with the female, except that the antennæ are 25-jointed, longer than the body, while segments 3 to 5 above are black.

Habitat.—Punduloya, Ceylon.

Types.—No. 3267, U.S.N.M. Three females and two males, reported by Mr. E. Ernest Green as having been bred from *Tachardia albizziæ*. It is likely, however, that he was deceived in this, and that the tineid larva mentioned in the introduction as preying upon the *Tachardia* is in reality the host of this *Bracon*.

APHRASTOBRACON, new genus (Ashmead).

Wings ample, the transverse median nervure received by the median cell before its apex, the submedian cell on the externo-medial nervure therefore distinctly shorter than the median; marginal cell extending to tip of wing; wings with the submedian cell very short, less than one-third the length of the median. Head transverse, the occiput immargined; eyes very large, occupying the whole side of the head, the face in consequence very narrow; maxillary palpi 5-jointed, labial palpi 3-jointed; otherwise as in typical species of *Bracon*.

It is extremely difficult, according to our present classification, to decide to which subfamily of the Braconidæ this remarkable genus belongs. It belongs to Wesmael's division Cyclostomi, and on account of the immargined occiput is allied to the subfamilies Braconinæ and Exothecinæ, but on account of the shortness of the submedian cell, which readily distinguishes the genus from all others yet described, it will not fit into either of these; the former has the submedian and median cells equal, while in the latter the submedian cell is the longer. It may therefore represent a new subfamily if the length of these cells is still to be considered of primary importance.

At present I prefer to place it in the subfamily Braconinæ, since I am inclined to believe that too much importance has been given to the length of the basal cells.

APHRASTOBRACON FLAVIPENNIS, new species (Ashmead).

Male.—Length, 4.5 mm. Brownish-yellow; eyes black, very large, occupying the whole side of the head and leaving the face very narrow. Antennæ about 48-jointed, as long as body, brown-black, the scape and pedicel beneath brownish-yellow; the scape is about three times as long as thick, the pedicel very small, the first joint of flagellum longer than wide and the longest flagellar joint, the others all being a little wider than long. The head and thorax, except the face, which is

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finely shagreened, are smooth and shining, the parapsidal furrows complete. The abdomen is oblong, the second segment with a basal triangular elevation, the first being grooved at the sides and forming a wedge-shaped plate; the third and fourth segments are delicately sculptured. Wings large, yellowish-hyaline; the costa, stigma, and veins yellow. The submedian cell is shorter than the median, the recurrent nervure joins the first submarginal cell at its apical fifth, the second abscissa of radius is about two and one-half times as long as the first, the second transverse cubitus being scarcely longer than the first abscissa of the radius, making the second submarginal cell very narrow.

Habitat.—Punduloya, Ceylon.

Type.—No. 3268, U.S.N.M. One male specimen bred from *Tachardia albizziæ* by Mr. E. Ernest Green.

Subfamily MICROGASTERINÆ.

Genus APANTELES, Förster.

Apanteles, FÖRSTER, Verh. pr. Rheinl. Natur. Ver., p. 245, 1862.

APANTELES PRATAPÆ, new species (Ashmead).

Female.—Length, 2.5 mm. Black, shining, the head and thorax rather densely, confluently punctate; scape, pedicel, and flagellum beneath for two-thirds its length, and legs, except hind coxæ, brownish-yellow, the extreme tip of hind tibiæ and hind tarsi subfuscous; palpi and tegulæ white; abdomen, except plate on first segment, and apex brownish-yellow. Face subconvex, with a slight median ridge; antennæ a little longer than the body; postscutellum with two foveolæ; metathorax rugulose, without carinæ. Wings hyaline, the stigma and veins brown, the upper side of the areolet open, two thirds the length of the first branch of radius, the submedian cell as much longer than the median cell as the length of the second discoidal cell. Abdomen short, hardly as long as the thorax, the ovipositor very short, not projecting beyond the tip of abdomen, plate of first segment twice as long as wide, sparsely punctate, the sides parallel; second segment more than twice as long as the third, with a median carina.

Habitat.—Punduloya, Ceylon.

Types.—No. 3269, U.S.N.M. Five female specimens bred by Mr. E. Ernest Green, from larva of *Pratapa deva*.

APANTELES TIVACHOLÆ, new species (Ashmead).

Female.—Length, 2.5 to 3 mm. Agrees well with the preceding species, except that only the two basal joints of antennæ are brownish-yellow. The legs are brownish-yellow, but *all* the coxæ are black, while the apex of hind femora, apex of their tibiæ and their tarsi are fuscous; the scutellum is smoother; the abdomen is as long as the thorax and,

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except venter, the membranous margins of first and second segments and lateral dorsal spots on third and fourth segments, which are yellow and sometimes confluent, is black; the plate of first segment is long trapezoidal, more than twice as long as wide at apex and shagreened apically; the second segment is as long as the fourth, feebly shagreened; the third is very short.

Male.—Length, 2.5 mm. Agrees well with female, except that the antennæ are longer, entirely black, while the abdomen is smaller, narrower and except the basal half of venter and lateral margins of basal segment, wholly black; the second segment, as well as the following, smooth and polished.

Habitat.—Punduloya, Ceylon.

Types.—No. 3270, U.S.N.M. Thirty-six females and fourteen males bred by Mr. E. Ernest Green from larva of *Tivachola plagiata*, Walker.

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AN ANNOTATED LIST OF BIRDS OBSERVED ON THE ISLAND OF MARGARITA, AND AT GUANTA AND LAGUAYRA, VENEZUELA.

By WIRT ROBINSON,
First Lieutenant, Fourth U. S. Artillery,
With critical notes and descriptions of new species,
By CHARLES W. RICHMOND.
Assistant Curator, Department of Birds.

I. BIRDS OF THE ISLAND OF MARGARITA, VENEZUELA.

DURING the winter of 1894–1895, in anticipation of a vacation in the following summer, I was casting about in my mind for a suitable locality to visit, when I received a note from Mr. C. W. Richmond, of the U. S. National Museum, calling my attention to a brief notice in the Ibis for January, 1895, in which Dr. P. L. Sclater suggested to ornithologists the advisability of turning their attention to the Island of Margarita, off the coast of Venezuela, as a field hitherto unworked. That this suggestion was justified, the results of my visit fully demonstrate.

Margarita can be reached from Laguayra or from Trinidad. Plying fortnightly between these points, and touching at many small intermediate ports, are two little steamers of the Carenero Railway and Navigation Company's line. These leave passengers and mails at Porlamar, the only town of importance on the south shore of the island. Many steamers bound westward from Trinidad touch at Carúpano on the Venezuelan coast, from which port small vessels are constantly crossing to Margarita.

I arrived at Laguayra on June 20, but could not get a steamer to Margarita until the 27th, so spent the week collecting in the vicinity of the town. I found all of the birds molting and in very poor plumage, so after the first two days I confined my attention to butterflies and reptiles, getting some 700 of the former and 40 of the latter.

On the morning of Sunday, June 30, my little steamer anchored about a mile from the beach at Porlamar and I was shortly taken ashore in a small boat, landed at 8 o'clock, secured quarters, and within half an hour was shooting birds in the scrub.

The Island of Margarita lies about midway between Laguayra and

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Trinidad, and only some 17 miles distant from the nearest point of the Venezuelan coast. Its greatest length from east to west is 42 miles, and its greatest breadth from north to south 20½ miles. It consists of two portions connected by a narrow isthmus 12 miles in length; the western being an irregular quadrilateral 12 miles long by 9 miles broad, and the eastern a pentagon some 20 miles across. In the western portion some almost barren peaks rise to a height of 2,300 feet.

Porlamar (formerly Pueblo de la Mar) is on the southern shore of the eastern portion. The adjacent country along the coast and for some three miles back is flat or gently rolling; the vegetation much like that of Curaçao, with small, scrubby, thorn trees, several species of post cacti (*Cereus*), which are now and then laden with a deliciously scented orchid (*Epidendrum*, sp.), thickets of the detestable prickly tuna (*Opuntia tuna*), whose pain-producing thorns are ever ready to enter the flesh, and other irritating plants of the pineapple and nettle families. At points along the beach, shallow salt lagoons occur, which are fringed with a scant growth of mangroves.

About 3 miles inland foothills begin, which rise by leaps to a central peak, 3,240 feet in height. Its summit is constantly enveloped in clouds, whose condensed moisture drips and trickles from every leaf and branch, and collecting, tumbles down its precipitous sides in beautifully limpid streams, abounding in large crayfish. The streams on the southern slope unite and pass seaward down a fertile valley—"El Val'e del Espíritu Santo"—by a tortuous channel which enters the sea a short distance east of Porlamar. During the rainy season the water reaches quite to the sea, but at the time of my visit the demands of the "acéquias," or irrigation ditches, and the thirsty soil of the flat coast region empty the bed several miles back and only a few stagnant pools occur here and there, filled with multitudes of small gasping minnows, much like the little mummichogs of our tide-water brooks.

Porlamar has an excellent supply of water piped from the mountain slopes in rear of El Valle, but at other points on the island water is extremely scarce. Three miles west of Porlamar in a desert of cactus is a solitary water hole, or "posa," a spot which we would designate as "mud puddle," a scant supply of foul-looking water at the bottom of a crater like depression, whose slopes are trodden smooth by the feet of the goats that come for water. To this place during the heat of the day came hordes of doves and pigeons to drink.

By the aid of irrigation, quantities of fruits, plantains, cassava, sugar cane, and corn are raised in El Valle; there are many groves of mangoes and cocoanut palms. The stream is thickly bordered with trees, and the mountain slopes in rear are covered with heavy forests.

The principal occupations of the inhabitants of the interior are the conversion of the sugar cane into rum and the manufacture of pottery and roofing tiles. Those who live near the coast are mainly engaged in fishing, and with nets, seines, and hooks capture an astonishing variety of fish, many being of remarkable shape and brilliant color.

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The population of the island, according to the census of 1873, was 31,000, and was increasing, so that it is now estimated at 40,000. I found the inhabitants most kind and hospitable.

Lying between Margarita and the mainland are two small islands, Cubagua and Coche, which for want of water are practically desert.

The mainland, which is in plain sight from Margarita, is a long chain of waterless, barren, and desolate mountains.

I collected in the vicinity of Porlamar during the eight days from June 30 to July 7, then moved to El Valle, where I spent a week, returning to Porlamar on July 15, and leaving the island on the 20th. During the latter part of my stay I was hourly expecting my steamer, so could not go any distance from the town. I lost one day by being lamed by the prick of the thorn of a melon cactus. In sixteen days' collecting I obtained two hundred skins, getting specimens of every land bird that I observed in a state of freedom except the two common vultures and a caracara eagle. A few birds were in good plumage, but the majority were worn, and the humming birds were in full molt when I left.

As would naturally be inferred from the great difference in the character of the vegetation at different parts of the island, the bird life at these points also varied. Thus the gulls, terns, skimmers, cormorants, pelicans, herons, plover, and turnstones were found along the beaches and nowhere else; *Ortalis*, *Amazona*, *Amazilia*, *Chiroxiphia*, *Arbelorhina*, *Vireo*, and *Platycichla* were confined to the heavy forest region; *Thamnophilus* and *Dendroplex* were found everywhere; *Eupsychortyx*, *Columba*, and *Spcotyto* were found only in the flat coast region; *Columbigallina rufipennis*, *Diplopterus*, *Volatinia*, *Tachyphonus*, and *Tanagra* were found only on the mountain slopes not heavily wooded, and the remaining species were found at all points except in the forests.

In addition to the birds, I secured specimens of a monkey (*Cebus apella*) whose fur emitted a very pleasant musky perfume; a rabbit something like ours, but without the cotton-tail (*Lepus brasiliensis*); a red squirrel, "ardito" (*Sciurus æstuans hoffmanni*), a rat (*Mus*), a spiny rat (*Loncheres*), an opossum, "rabo pelado" (*Didelphys murina*), the native name implying skinned or hairless tail; and two small bats (*Vesperugo parvulus* and *Schizostoma megalotes*). A deer occurs and the common mouse and other small mammals.

The literature of Margarita is meager. Dr. A. Ernst[1] gives a partial list of the plants of the island, but this is the only scientific reference to its flora or fauna that I have been able to find. However, all of the few travelers who have written of Margarita refer to its birds. Thus, M. Lavaysse[2] writes:

> From Pueblo de la Mar to Pampatar * * * humming birds and the harmonious notes of other tropical birds diverted my attention.

[1] Carácas, 1881, Esbozos de Venezuela.

[2] "A statistical, commercial, and political description of Venezuela, Trinidad, Margarita, and Tobago," London, 1820, p. 146.

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Again, Capt. W. J. Adam,[1] in alluding to the portion of his journey from Juan Griego to Forte Norte, says:

As we proceeded, we saw several flocks of a small species of Parrot, called by the natives *Paroquetta:* the bill, wings, and plumage are uniformly gray; they are apt scholars, and quickly taught to imitate the varieties of the human voice. We also saw the bird, from its cry called *Tropyall*, a bird much sought for, about the size of our common thrush; it has a bright yellow top, with breast of the same color, whilst the wings and back exhibit a mixture of white, red, and black; its plumage is highly prized as an ornament by the Indian chiefs on the Maine. The brilliant colors of the woodpecker frequently arrested our attention, and a numerous list of other kinds which it would be foreign from my present purpose to notice.

Finally, the late Dr. John F. Chittenden,[2] speaking of his ride from Pampatar to Porlamar, says:

But the most interesting feature in my ride was certainly the marvelous collection of birds of every variety and the gayest plumage. I never saw so many together out of an aviary. Troupials, humming birds, and some in full song, the "rossignol" pointed out to me is probably a troglodyte, but to me appeared larger than the "Oiseau de Bon Dieu" of Trinidad. The song is most melodious and comprises many different notes, but not equal, of course, to the nightingale of Europe.

At another point he refers to the large flocks of pelicans along the coast.

From these extracts it is seen that before my visit our knowledge of the ornithology of this island was limited to the facts that bird life there was abundant, and that there occurred the pelican, the troupial, and certain undetermined species of parrakeet, woodpecker, humming bird, and mocking bird (the "rossignol" of Dr. Chittenden).

Of the 71 species determined by my observations, 17 are water birds, and include an undescribed form, and 54 are land birds including no less than ten new species.

In addition to the 73 species enumerated below, I observed an undetermined plover, a flock of large waders which at a distance resembled willets, and several species of large herons, but no other land birds. The natives described others to me, but I am unable to identify the birds from their descriptions. The most striking among them was the "ñángaro," a species of parrakeet with a longer beak than *C. æruginosus*. It may possibly be the bird referred to by Captain Adam. It is to be found at the harvest season. Another bird, the "macagua," lives on the mountain slopes, runs on the ground like a partridge, is easily decoyed by imitating its call, and is tailless. It is probably an ant thrush (*Formicarius*) or a tinamou.

The avifauna of Margarita, as far as represented in my collection, is wholly derived from Venezuela. No purely west Indian forms are present. In a very few cases the occurrence of a species in Venezuela

[1] "Journal of Voyages to Marguaritta, Trinidad, and Maturin, 1819, 1820," Dublin, 1824, p. 22.

[2] Port of Spain Gazette, Trinidad, Nov. 4, 1893.

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is yet unproven, but its presence in Margarita is considered pretty good evidence of its inhabiting the mainland.

The determination of the species was undertaken by Mr. Richmond, who is therefore responsible for the names used in the following list.

Family LARIDÆ.

1. LARUS ATRICILLA, Linnæus.

LAUGHING GULL.

Native name: "Guanaguanare."

Abundant and not at all shy, approaching within a few feet to pick up the bits of fish tossed to them by the fishermen. My specimen, a female, was strongly tinged with roseate on the breast.

2. PHAËTHUSA MAGNIROSTRIS (Lichtenstein.)

LARGE-BILLED TERN.

Only a few were seen along the beaches of Margarita, but at the mouth of the river Manzanares at Cumaná, some 40 miles distant, I saw them in swarms attending the large flocks of brown pelicans in their fishing parties.

3. ? STERNA EURYGNATHA, Saunders.

RED-BILLED TERN.

Common along the beaches.

[A single specimen represented in the collection may belong to this species. It is almost identical in color with *acuflavidus*, except that the bill is yellow, with an ill-defined area of blackish about the middle third of both maxilla and mandible. The angle of the mandible is well in front of the anterior part of the nostril, thus opposing Saunders's description. Rump, upper tail-coverts, and upper surface of tail well washed with gray, darker on ends of the tail feathers. The long outer wing quills are replaced by pinfeathers, thus preventing measurement of this part. The specimen appears to be immature. "Beak yellowish, middle third black; legs black; soles of feet yellow." C. W. R.]

4. STERNA ANTILLARUM (Lesson).

LEAST TERN.

Abundant, and probably with young in July, as whenever I approached the sandy flats that they affected particularly, they hovered around me screeching incessantly until I withdrew.

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Family RHYNCHOPIDÆ.

5. RYNCHOPS NIGRA, Linnæus.

BLACK SKIMMER.

Not until the day before my departure from Margarita did I observe this skimmer. I was strolling along the beach after dark on a very quiet evening when not a breath of air was stirring, and the little swell pulsing on the ocean caused no more than a thin, silvery sheet of water to now and then glide over the smooth sand and steal back as quietly as it had come. As I turned at one spot to glance back, I became aware of a large bird flitting by so close that I could distinctly hear the swish of its wings. In a few seconds another passed, and stooping down so as to bring it in relief against the horizon, I easily recognized it. The next day I saw others. They fly with their wings held high above their bodies, and prefer to skim over this thin sheet of water that is thrown over the sands by the waves as they break. They leave a distinct ripple in their wake.

Family PHALACROCORACIDÆ.

6. PHALACROCORAX, sp.

CORMORANT.

Native name "cotúa."

This small, dark, and glossy cormorant was fairly abundant along the beaches of Margarita, but no specimens were secured.

Family PELECANIDÆ.

7. PELECANUS FUSCUS, Linnæus.

BROWN PELICAN.

Native name "alcatraz."

Abundant at Margarita and along the neighboring coast of the mainland, fishing at times in parties of hundreds. At Margarita they always assembled as the fishermen drew their nets, and as the net was gradually pursed, a steady stream of pelicans could be seen plunging headlong from the air into the water, rising and plunging again.

Family FREGATIDÆ.

8. FREGATA AQUILA (Linnæus.)

MAN-O'-WAR BIRD.

Native name "tijereta," i. e., scissor-tail.

Common along the beaches, the piebald young and the darker adults fishing together. Though fishing from on wing, I did not see any plunge into the water like the pelicans, but swooping over the spot they struck

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downward with their beaks as they passed, making a sound like that produced by an arrow shot into water. They invariably rose after catching the fish, and, tossing it up, dexterously adjusted it before swallowing it. I daily saw them associated with black vultures soaring at a great height over the cactus thickets west of Porlamar.

Family ANATIDÆ.

9. DENDROCYGNA, sp.

TREE DUCK.

In the lagoon at the southeast extremity of the island, I saw a flock of a half dozen tree ducks, but I was unable to approach within range. They flew off toward the mainland.

Family ARDEIDÆ.

10. GARZETTA CANDIDISSIMA (Gmelin).

SNOWY HERON.

The native name for all species of herons is "garza."

In the lagoon to the east of Porlamar, I saw herons of several kinds, but obtained only this and the following. I saw other snowy herons along the stagnant pools in the bed of the stream running down from El Valle.

11. BUTORIDES ROBINSONI, new species.

MARGARITAN GREEN HERON.

Although I saw several pairs of these herons among the dead mangroves along the shores of the lagoon, I shot but one specimen, as I thought it was the same as our *B. virescens*.

[*Type*.—Male adult, No. 151635, U.S.N.M.; Margarita, July 7, 1895; Wirt Robinson; collector's No. 446. Cap and lengthened occipital feathers glossy bottle green, some of the feathers washed with slate; sides and back of neck slaty drab, tinged with fawn color, deeper on back of neck; ear-coverts same, mixed with cinnamon; throat buffy white, with a row of black spots on each side of the median line; sides of throat and cheeks edged with pale cinnamon; fore neck on median line (narrowly) buffy white, heavily streaked with cinnamon and darker brown, and washed with fawn color; back, rump, upper tail-coverts, tail (upper surface), and scapular plumes, mostly glossy light bottle green, strongly washed with pale slate, some of the feathers entirely without greenish tinge; the scapular plumes with pale linear shaft streaks; primaries and secondaries slaty gray; tertiaries glossy light bottle green; most of the tertiaries and first primary narrowly edged on outer webs with whitish; wing-coverts glossy light bottle green, and (except primary coverts) more or less broadly bordered with buff,

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darker on lesser and middle coverts; breast and sides of body smoke gray; abdomen and under tail coverts light buffy gray; thighs wood brown. Under surface of wings and tail light slaty gray, lighter on axillaries and under wing-coverts, outer border of the latter mixed with pale cinnamon; border of wings buffy white, mixed with pale cinnamon; "irides yellowish red; feet orange." Wing, 6.13; tail, 2.18; tarsus, 1.78; culmen, 2.35 inches. This species appears to be closely related to *B. striata* of South America, but is considerably smaller, and the color of the fore and hind neck and edge of wing approach *B. virescens*.—C. W. R.]

Family SCOLOPACIDÆ.

12. EREUNETES OCCIDENTALIS, Lawrence.

WESTERN SANDPIPER.

13. CALIDRIS ARENARIA (Linnæus).

SANDERLING.

Along the shores of the lagoon east of Porlamar there were many flocks of small sandpipers and plovers, and, on July 7, at one shot, I obtained the two above, two species of plover, and a turnstone.

Family ŒDICNEMIDÆ.

14. ŒDICNEMUS BISTRIATUS (Wagler).

AMERICAN THICK-KNEE.

Native name "guara." In a courtyard of a dwelling in Porlamar, I saw several pairs of these birds, and their owner told me that he had caught them when not fully fledged in the wide savanna to the west of the town. Their eyes are most brilliant yellow, like those of an owl.

Family CHARADRIIDÆ.

15. ÆGIALITIS WILSONIA RUFINUCHA, Ridgway.

RUFOUS-NAPED PLOVER.

Legs grayish pink.

[A male in the collection has the pectoral band of the usual width; brown, mixed with black.—C. W. R.]

16. ÆGIALITIS SEMIPALMATA, Bonaparte.

SEMIPALMATED PLOVER.

One shot July 7. Legs clay color, base of beak orange.

17. ÆGIALITIS NIVOSA, Cassin.

SNOWY PLOVER.

A specimen obtained July 2. Legs grayish blue.

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18 ÆGIALITIS COLLARIS, Vieillot.

AZARA'S RING PLOVER.

The native name for these plovers is "tigüi-tigüi," from their notes. They were all common along the beaches. I saw still another species with darker breast, but did not succeed in getting a specimen. Legs flesh.

Family APHRIZIDÆ.

19. ARENARIA INTERPRES, (Linnæus).

TURNSTONE.

A specimen obtained July 7. Several large flocks seen at the lagoon.

Family TETRAONIDÆ.

20. EUPSYCHORTYX PALLIDUS, new species.

MARGARITAN CRESTED QUAIL.

These handsome birds were abundant in the thorny thickets near the coast, but none were seen in the interior of the island. They ran through the cactus undergrowth with incredible swiftness and it was a difficult matter to cause them to take wing. The call of the males is identical with that of our common bob-white, and the call of the scattered members of a covey is also the same. The native name is "perdiz."

[*Type.*—Male adult, No. 151636, U.S.N.M; Margarita, July 2, 1895; Wirt Robinson; collector's No. 384. This bird is closely related to *E. sonnini* of Venezuela, and does not require a separate description. The Margaritan birds are considerably paler than *E. sonnini*, except on the throat, where the color is about the same. The females are particularly pallid on the under parts. There is no difference in the pattern of coloration of the head in the male between the island bird and *E. sonnini*. The dimensions appear to be the same in both forms, the type of the present bird measuring: Wing, 3.75; tail, 2.30; tarsus, 1.05; exposed culmen, 0.50 inches. The material upon which this form is based, and that of *E. sonnini* available for comparison, is very scanty, consisting of three specimens of the former, and a male from the island of St. Thomas[1] and a female from Venezuela of the latter. Meager as this is, it is considered desirable to separate the two forms on the evidence presented, and on the fact that at least two other species (*Doleromya* and *Speotyto*) characteristic of the cactus thickets are pale representatives of mainland birds. Temminck's and Gould's plates of *E. sonnini* also show a darker bird than *E. pallidus*.—C. W. R.]

[1]American Museum of Natural History collection. I have to thank Messrs. J. A. Allen and Frank M. Chapman of that institution for numerous specimens from Venezuela and Trinidad sent on at my request for comparison with birds collected by Lieutenant Robinson.

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Family CRACIDÆ.

21. ? ORTALIS RUFICAUDA, Jardine.

CHACHALACA.

Native name, "guacharaca."

They are found sparingly in the mountains around El Valle, but although I made three separate trips after them, accompanied each time by an experienced hunter, I got none, and only once did I even hear their notes. The identification is from my description of a specimen in captivity.

Family COLUMBIDÆ.

22. COLUMBA GYMNOPHTHALMA, Temminck.

BARE-FACED PIGEON.

Native name, "paloma."

Found sparingly in the savanna to the west of Porlamar. I was told that at other seasons they were abundant. The two specimens that I obtained were badly soiled about the foreheads by the juice of the fruit of the post cactus. One, a young female, was without the granulated ring around the orbit.

[The adult female in the collection lacks the "reddish opaline" and blackish bands of the male on the hind neck; the bands or bars in this specimen are similar to those on the sides of neck, but with the blackish bars replaced by dusky brownish ones. This difference is a sexual one, then, and not due to immaturity, as thought by Mr. Hartert. The immature female has these bands on sides and back of neck only slightly indicated, and the breast and abdomen are tinged with brown; the ring of papillæ round the eye is absent, but there is an indication of a difference in structure between this ring and the inner one. Lieutenant Robinson obtained a male on Curaçao during his former visit to South America, and Mr. Hartert also met with it on the same island. The U. S. National Museum possesses an adult male from the island of St. Thomas, collected by A. D. Armes about the year 1873. This will add another species to the avifauna of St. Thomas, and also one common to that island and Curaçao. From the fact of its inhabiting Margarita (whose avifauna seems to be exclusively derived from the mainland), it is quite probable that Herr Peter's statement[1] that it occurs on the coast of Venezuela is correct.—C. W. R.]

23. ZENAIDA VINACEO-RUFA, Ridgway.

VINACEOUS DOVE.

Native name "guarame."

Common near the seashore. I killed five at one shot at the water hole west of Porlamar. Irides brown.

[These specimens are typical of this form.—C. W. R.]

[1] Jour. für Orn., Jan., 1892, p. 112.

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24. LEPTOTILA INSULARIS, new species.

MARGARITAN DOVE.

Native name "pipi."

Irides yellowish, skin around eyes deep blue, beak black, feet reddish pink. Fairly common and very good eating. I saw "pipis" on the mainland at Laguayra and at Guanta, but did not get any specimens for comparison with this island form.

[*Type.*—Male adult, No. 151639, U.S.N.M.; Margarita, July 6, 1895; Wirt Robinson; collector's No. 437. Back, rump, upper tail-coverts, central tail feathers, tertiaries, and wing-coverts, grayish olive; primaries and secondaries (especially at tips), blackish brown, the former (except first) with more or less narrow whitish edges; tail feathers black, four outer pairs tipped with white, narrowly on the inner one, but increasing toward the outer pair, on which the white tip is one-half inch broad; outer web of outer tail feather narrowly edged with white for its exposed portion; outer webs of outer tail feathers, except last, mostly grayish olive. Forehead, lores, cheeks, ear-coverts, and lower throat, ecru-drab, passing into pale vinaceous on breast and sides of neck, and becoming lighter again on lower breast; chin and center of throat white; center of crown distinctly French gray, passing posteriorly into dull plumbeous mixed with vinaceous on hind neck, the feathers on sides of occiput, hind neck, and slightly on sides of neck rather sparingly glossed with purple, and on lower part of hind neck with green. Center of abdomen and under tail-coverts white; sides of body brownish buff, darker on flanks; axillaries, under wing-coverts, and most of under side of primaries, chestnut; first primary only narrowly edged with chestnut on inner web. Wing, 5.07; tail, 4; tarsus, 1.01; exposed culmen, 0.66 inches. This specimen is the only one of the four represented in the series in which the center of the crown is of a pronounced grayish color, but the others have a trace of it, somewhat masked by the vinaceous tinge of the surrounding parts. The other specimens have the inner web of the first primary mostly chestnut, instead of a narrow edging as in the type. This species is closely related to *L. verreauxi*, but is smaller, grayer above, with metallic colors on hind neck, occiput, and sides of neck less pronounced. Trinidad and Tobago birds resemble the Margarita form in size, but the colors are more like true *L. verreauxi*. Three other specimens of *L. insularis* measure: Male adult, wing, 5.25; tail, 4.15; tarsus, 1.07; culmen, 0.68 inches. Female adult, wing, 5.27; tail, 4.08; tarsus, 1.07; culmen, 0.67 inches. Female adult, wing, 5.23; tail, 4.10; tarsus, 1; culmen, 0.64 inches.—C. W. R.]

25. COLUMBIGALLINA PASSERINA (Linnæus).

GROUND DOVE.

Native name "tórtola."

Extremely abundant in all parts of the island.

[The Margarita birds belong to a small pale form, but whether *C. bahamensis*, Maynard, or *C. perpallida*, Hartert, or something still different,

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I can not now determine. There are two males in the collection from Margarita; one has red at the base of the bill, the other yellow; the red-billed one has dark under tail-coverts, while those in the yellow-billed one are lighter. An adult male from Curaçao collected on this trip is similar to the yellow-billed Margarita bird, but the bill is somewhat brighter yellow.—C. W. R.]

26. COLUMBIGALLINA RUFIPENNIS (Bonaparte).

RUFOUS GROUND DOVE.

Native name "tórtola de monte."

I saw in all about a dozen individuals and these were associated with flocks of the preceding species in the fields on the mountain slopes in rear of El Valle.

[Examples of this species from Margarita do not differ from those from other localities.—C. W. R.]

27. SCARDAFELLA RIDGWAYI, new species.

RIDGWAY'S SCALED DOVE.

Native name "potoco," from its note of three syllables.

Without doubt this was the most abundant bird on the island and was found in all parts. They came to the water holes in swarms and I once secured nine at a shot. Like other doves, they strike their wings rapidly upon rising, but instead of giving out a whistling sound the noise is a rattle like that of dry seeds shaken in a gourd. Beak dark, irides red, feet flesh. At Guanta I saw great numbers of scaled doves with the same note as these, but got none for comparison.

[*Type*.—Male adult, No. 151644, U.S.N.M.; Margarita, June 30, 1895; Wirt Robinson; collector's No. 362. Upper parts (except forehead, forecrown, wing-coverts, and primaries), including middle pair of rectrices, brown—between broccoli and hair brown, the feathers all tipped with dull greenish or bluish black, narrowest on nape and hind crown; primaries brownish black externally, dark hazel on inner webs and at base of outer webs, appearing on exposed portion of wing as a small, irregular spot, just beyond primary coverts; secondaries, dark brownish black, narrowly edged with white on the outer web; feathers of wing-coverts mainly white on outer web, brown on inner web, and broadly tipped with black; primary coverts and alula, dull black; forehead, forecrown, superciliary line, and sides of head, pale pinkish white, lighter on lores and ear-coverts, the feathers mostly narrowly edged with black; throat white, passing into pale vinaceous on breast, sides of breast, and sides of neck, the feathers on breast with faint indications of black edges, more pronounced on lower part and on sides, remainder of under parts white, with a wash of pale fawn color on sides, all the feathers edged with white, these edges broadest on lower breast and sides of body. Five outer pairs of rectrices black basally, the terminal part white; on the outer feather the white occupies about 1.60 inches; this decreases by "steps" to the fifth, which has only a slight

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mottling of white at the end. Under wing-coverts externally chestnut, the feathers with black tips, the inner part wholly black; axillaries, black. Wing, 3.82; tail, 3.90; tarsus, 0.68; exposed culmen, 0.60 inches. This species differs from *S. squamosa* mainly in its longer bill and in the broader black edgings to the feathers, which in the new species are about twice as wide as those of *S. squamosa*. The vinaceous color is a little deeper in the former, but this may be due to the fresh condition of the specimens. The single specimen in the National Museum collection from the mainland of Venezuela, examined in this connection, is similar to the Margarita bird, but the bill is short as in the Brazilian specimens of *S. squamosa*.

I take great pleasure in naming this species for Mr. Ridgway, who first pointed out the difference between the Brazilian and Venezuelan birds twenty-two years ago.[1]—C. W. R.]

Family CATHARTIDÆ.

28. CATHARTES AURA (Linnæus).

TURKEY VULTURE.

Native name "olaya."

Common, but not so much so as the following species:

29. CATHARISTA ATRATA (Bartram).

BLACK VULTURE.

Native names "zamurro" and "guaraguao," the latter being the Indian name.

Abundant everywhere.

Family FALCONIDÆ.

30. BUTEO ALBICAUDATUS, Vieillot.

WHITE-TAILED BUZZARD.

Native name "gavilán."

I saw probably a dozen individuals, and obtained one specimen, a young bird. Its cere was blue, irides brown, and feet yellow, and its stomach contained portions of a snake. The natives told me that this hawk destroys much poultry.

31. FALCO SPARVERIUS, Linnæus.

SPARROW HAWK.

Native name "rapiña."

Abundant. Their principal food is a large green grasshopper (*Tropidacris*, sp.), which the natives call "naragangato," and which is very common in the scrub along the coast. These insects have the under

[1] Hist. N. A. Birds, III, p. 387.

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wings of a bluish tinge and the bodies marked with red and green, and some are as much as 8 inches in expanse. They are also eaten by the several small owls that are found on the island. One sparrow hawk had eaten a lizard in addition to several grasshoppers.

[Four specimens, two males and two females, are represented in the collection. The males can be very closely matched with a specimen from Gainesville, Florida, both in color and size. They are almost uniform in color below, one only has a few spots on the lower sides; the backs are uniform, with a few black bars on the longer scapulars; the crown is uniform gray in one, with a small chestnut patch in the other. The specimens are larger than examples of *F. brevipennis* from Curaçao. The wings measure: Males, 6.80 and 6.75; females, 7.20 and 7.12 inches. Tails measure: Males, 4.75; females, 4.70 and 5.25 inches.—C. W. R.]

32. POLYBORUS CHERIWAY (Jacquinot).

AUDUBON'S CARACARA.

Native name "caracara."

I saw a few of these birds flying about to the west of Porlamar, but did not succeed in getting a specimen.

Family BUBONIDÆ.

33. MEGASCOPS BRASILIANUS (Gmelin).

BRAZILIAN SCREECH OWL.

Native name "chaure."

I obtained one specimen in the scrub west of Porlamar. Seeing a small but very thickly foliaged tree and thinking that it was a likely hiding place for an owl, I threw a stone into it, when this specimen darted out on the opposite side and was quickly lost to sight in the thorny jungle. Following after, I hunted for it for some time and was despairing of finding it, when I heard the scolding notes of some mocking birds near by and made toward them. Just as I had located the particular clump of cactus and thorn trees in which they were, they flew off, and I was again on the point of giving up my search, when I heard the angry buzzing and squeaking of a buff-breasted humming bird (*Doleromya pallida*), and soon detected the owl perched near the ground and the little hummer flying almost into its face.

This owl had a thorn of the tuna through the nictitating membrane of one eye. These thorns are a curse to the living creatures of the island; man and the domestic animals suffer from them; I shot a rabbit with the thorns deep in its flesh; I found them in all of the pigeons and doves, in the burrowing owls, entirely through the wings of a partridge, and dozens in the legs of every large iguana that I caught. Whilst careless of them at first, I grew to dread them more and more the longer I stayed, and finally shrunk from them with horror.

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34. SPEOTYTO BRACHYPTERA, new species.

SHORT-WINGED BURROWING OWL.

Native name "moriquite."

The level land to the east of Porlamar is more sandy than that to the west, and the vegetation is, in consequence, scantier. There are here and there open patches of several acres in extent covered with a sparse faded yellowish grass and dotted with melon cactus (*Melocactus communis*). In these spots I was certain to find little colonies of burrowing owls living in burrows that had been made either by a land tortoise somewhat like the Florida gopher or by a rabbit. Their color harmonizes with that of the grass, and, standing erect and motionless among the cactus melons, they are easily overlooked unless approached so close that they fly a short distance or slink off like a cat. When they have thus revealed their presence, they perform various bows and nods toward their disturber, uttering at the same time a low tremulous note a little like some of the notes of our screech owl. Among my specimens was one young bird in immature plumage. The stomachs of all contained grasshoppers and fragments of beetles. I saw none at all among the hills.

[*Type*.—Male adult, No. 151660, U.S.N.M.; Margarita, June 30, 1895; Wirt Robinson; collector's No. 365. Similar to *S. cunicularia*, but paler and very much smaller; the tarsi feathered only about halfway, with straggling hairs continued down on the toes; brown bars on under parts much paler and narrower; rump and upper tail-coverts uniform pale cinnamon, without spots or bars; under tail-coverts uniform buffy white; under wing coverts and axillaries immaculate buff; middle rectrices with five light bars; three innermost bars on outer web of first primary are connected. "Irides yellow." Wing, 5.48; tail, 2.41; tarsus, 1.70; exposed culmen (without cere), 0.52 inches. Two other adult males measure: Wing, 5.80 and 5.82; tail, 2.55 and 2.40; tarsi, 1.77 and 1.80 inches, respectively. An adult female measures: Wing, 5.90; tail, 2.54; tarsus, 1.63; exposed culmen (without cere), 0.57 inches. The various forms of *Speotyto*, described from the West Indies, Bahamas, and Florida, appear to have the under wing-coverts mottled or spotted, while the true *S. cunicularia*, *hypogæa*, *rostrata*, and the present form have them uniform buff. In examining a large series of the first two, I find an occasional specimen with indications of mottled under wing-coverts; but this character is very exceptional. The forms nearest in size to the Margarita bird are the *S. maura* and *guadeloupensis* of the West Indies; but they are both very dark birds, and at once distinguishable without regard to size.—C. W. R.]

35. GLAUCIDIUM PHALÆNOIDES (Daudin).

FERRUGINOUS PYGMY OWL.

Native name "lechuza."

Irides, cere, beak, and feet yellow. I tried repeatedly to attract birds in Margarita by making that "screeping" noise which is so effective

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with us at certain seasons, but I met with success only once, and then in a deeply shaded spot along the bed of the stream from El Valle, when at the first note one of these little owls dashed up, evidently expecting to find something upon which to prey. I believe that these owls hunt by day, as the sun caused them no apparent discomfort. I found the three others that I obtained by being attracted by the scolding notes of mocking birds. They are subject to dichromatism, as three were in the red plumage and one in the gray. The barring of the tail of the gray one was quite different from that of the others. These owls have a pair of marks at the back of the neck which in life and at a little distance look like a pair of half closed eyes, so that at first I was not certain whether they were looking toward me or from me. These marks are almost entirely hidden in a made-up skin.

Family PSITTACIDÆ.

36. CONURUS ÆRUGINOSUS (Linnæus).

RUSTY PARRAKEET.

Native name "perico."

Abundant, being found in large flocks in the flat coast region and in the cultivated hills around El Valle. I was told that they could be taught to talk. Those that I obtained were in rather worn plumage.

[Not different from mainland birds.—C. W. R.]

37. AMAZONA AMAZONICA (Linnæus).

AMAZONIAN PARROT.

Native names "loro" and "cotorra."

I saw many large flocks in the heavy forests in rear of El Valle. There is in these forests a parasite which, starting from an insignificant seed dropped upon a branch by some bird, lets down fine cord-like roots, which, descending for 50 or 60 feet, reach the earth, and obtaining a foothold there rapidly increase until the parent tree is choked and destroyed, and the parasite alone remains, one of the loftiest trees in the forest. Its leaves are large, pear-shaped, and glossy like those of our magnolia, its blossoms white, and wide open like a wild rose; the fruit, smooth and the size of a peach, opens like a chestnut burr, but in eight segments, disclosing in the interior a fleshy pyramid with longitudinal slits filled with rice-like seed, red and pulpy. It is called by the natives "copey," and is probably *Clusia rosea.*

From its peculiar manner of propagation, it is evident that the seeds must be attractive to birds, and so I found them. For several mornings I took my stand before daybreak under a very large one near El Valle, and at the first sign of dawn the tree top burst into life, and positively swarmed with birds. Three flycatchers, three tanagers, a grackle, two orioles, and a vireo took part in the feast; the beautiful azure-crowned honey creeper came literally by hundreds and poised, like a humming

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bird, with rapid vibrating wings, beneath the open fruit, by means of its long beak extracted the seeds from the depths of the cavities. The parrots, too heavy for such work and with beaks too thick to enter the cavities, hung head downward on the fruit and tore its thick and gummy outer rind into fragments to get at the coveted interior. When a flock of parrots was at work in a copey, the bits of rind fell like a shower. The juice of the rind hardens on their beaks and plumage like india rubber, and I found it impossible to remove it with water, although spirits of turpentine dissolved it freely. One of my parrots, a female, had the tips of all of her tail feathers so badly worn that I thought at first that I had shot an escaped cage bird, but I was told that they nest in hollow trees and that their tails are worn by the smallness of the hollows.

[The specimens collected by Lieutenant Robinson are typical of *A. amazonica*.—C. W. R.]

Family CUCULIDÆ.

38. CROTOPHAGA ANI, Linnæus.

ANI.

Native name "garrapatero," i. e., tick eater, from its alleged habit of eating the "garrapatos," or ticks, from the backs of cattle.

Common and usually in small parties of from six to a dozen individuals. Found in open land, and often seen walking about among cattle like our cow bird. I am inclined to believe that these birds not only associate in communities, but have a nest in common. Upon arriving at Laguayra, I discovered one of their nests, a bulky structure of coarse twigs, in a cocoanut palm near the town. I made no attempt to get it, but on the night of June 25 there was a high wind, and, going out the next morning, I found that the nest had blown down. It had fallen in rank grass, and all of the eggs were not broken. It had contained 15 fresh eggs, of which nine were uninjured.

39. DIPLOPTERUS NÆVIUS (Linnæus).

TAWNY CUCKOO.

Native name "sentín."

I saw several pairs of these birds in the small thickets on the partly bare hillsides near El Valle, and obtained one specimen.

Family BUCCONIDÆ.

40. BUCCO BICINCTUS (Gould).

TWO-BANDED PUFF-BIRD.

Common, especially in the fringe of trees along the stream from El Valle. They are very quiet birds, and will sit motionless whilst they are observed from a distance of a few feet. They have a note a little

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like our flickers, and begin slowly on a low key and run up crescendo, increasing the rapidity and pitch of the note. They nest in a hole constructed in the large nests of the white-bodied and chestnut-headed wood lice which are common in the trees along the stream.

[A pair in the collection hardly differ from a specimen from Venezuela, but are very slightly paler on the throat.—C. W. R.]

Family PICIDÆ.

41. MELANERPES SUBELEGANS (Bonaparte).

BONAPARTE'S WOODPECKER.

Native name "carpintero."

Abundant. Their nests near El Valle were usually constructed in cocoa palms. On July 9 at El Valle a child brought in to me a young bird barely able to fly.

[The proper name for the present bird is without doubt *M. subelegans* of Bonaparte, although some ornithologists, principally the English, have for a long time relegated this name to the synonymy of *Melanerpes aurifrons* (Wagler), probably following Sclater, who seems to have been the first to make the mistake.

This form was first described by Bonaparte[1] under the name *Centurus subelegans*. He compared his bird with the *C. elegans* of Swainson, and gave the locality as "Mexico." In 1850, in his "Conspectus," he again described it in almost the same words, but corrected the locality to "Venezuela." Here he quoted as references his original description and "*tricolor!* Gr. 1849, *ex* Wagl. 1829." In the first description he neglected to mention the color of the abdomen, but did so in the second, giving it as red. In describing *C. subelegans* he writes, "fronte et cervice subauratis," and in a comparison which follows says it "resembles Mr. Swainson's *Centurus elegans*, but is well distinguished by wanting the very conspicuous black superciliary spot and by the much less brilliant gold color of the crown." This agrees very well in the main with the bird now under consideration, but *M. aurifrons* (Wagler), with which this description is made to fit by those who reject the name *subelegans*, is a much larger bird, and with the golden color of the nape fully as brilliant, if not even more so. It has a yellow belly, while *subelegans* (as shown in his second description) has a red belly. If he had been comparing *M. aurifrons* with *M. elegans* in the original description of *C. subelegans*, he would probably have mentioned the great difference in size, as he did in comparing his *C. santa-cruzi* with *P. aurifrons* [=*rubriventris*] a few pages over in the same paper.[2]

Now, there is a discrepancy in his description of *subelegans*, when applied to the present bird, for he says "fronte et cervice subauratis;" the bird long known as *C. tricolor* has the forehead yellow, but the nape

[1] Proc. Zool. Soc. Lond., 1837, 109.

[2] Proc. Zool. Soc., 1837, p. 116.

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is *red*, paler than the crown, and separated from it. In some specimens, as in the Margarita example in worn plumage, this red nape is considerably worn and faded, and has a distinct golden hue, with only a slight tint of red remaining. Could not Bonaparte have based his description on a similar specimen? At any rate, red or yellow, the nape is never as broad or brilliant as in *elegans*.

Here is Bonaparte's second description, the words in brackets being those not found in the original one:

[*Minor*], *albo-nigroque fasciatus; subtus, cum capite, dilute cinerascens: vertice* [*abdominisque medio*] *rubris; fronte et cervice subauratis:* [*macula oculari nigra nulla*].

The words "minor" and "macula oculari nigra nulla" are comparative with *C. elegans* immediately preceding this description; the "abdominisque medio" [rubris] refers to the color of the abdomen, lacking in the original description. Now this does *not* refer to *M. aurifrons*, and the objection to Bonaparte's name appears to rest on this point.

The specific name *tricolor* has very commonly been used to designate the birds ranging from the Isthmus through Colombia and Venezuela. This name was first used by Gmelin, whose *Picus tricolor*, said to inhabit Mexico, is considered unrecognizable. Later, Wagler described in detail a bird in the Berlin Museum as *Picus tricolor*,[1] thought to be from Mexico, but since shown by Cabanis to have come from Cartagena, Colombia.

Recently Salvin and Godman[2] have very properly discarded the name *tricolor* of Wagler for the bird inhabiting the Isthmus and applied a new name, *wagleri*, in its stead. Von Berlepsch described *Centurus terricolor*[3] from the "Orinoco district or Trinidad" some years ago, and compared his bird with Bogota specimens, which were thought to be *tricolor*. The former was said to differ from *tricolor* in being larger, with longer bill, darker on head and under parts, and in barred upper tail-coverts. Now, if Orinoco or Venezuelan examples are compared with Panama specimens, which are the same as the Cartagena form, we shall have to describe them as *smaller* instead of *larger* than "*tricolor*"!

In other words, we have three forms—one, *wagleri*, from Chiriqui, Panama, and along the coast of Colombia; second, a smaller form in Venezuela, including Tobago, the Orinoco region, and probably Trinidad; and finally a still smaller form from Bogota, which appears to be unnamed, and may be called *neglectus*. The second form mentioned is the one called *terricolor* by Von Berlepsch, but is really the *subelegans* of Bonaparte, and this latter name should be employed in its place.

The characters given in the books to separate *wagleri* from *subelegans* are not very satisfactory. I can not find any difference in the color of the under parts (but should state that I have seen no males of *neglectus*), and the barring of the upper tail-coverts and rump are very uncertain and occur in both forms more or less. There is a difference in size,

[1] Isis, 1829, 512.

[2] Biol. Cent. Am., Aves, II, 1895, 416.

[3] Ibis, 1880, 113.

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especially in length of wing, which will aid in distinguishing them; the size of the bill is, however, about the same in both forms. The best character I can find is in the extent of the red crown, which is continuous with the nape in *wagleri*, but separated from it in *subelegans*, although this may prove of no value when a large series shall have been examined. What the difference on this point is between *neglectus* and the two just mentioned I am unable to say.

In view of the above facts I would follow Dr. Allen[1] in restoring Bonaparte's name *subelegans* for the Venezuelan form and the three birds will then stand:

Melanerpes subelegans (BONAPARTE). Venezuela; Tobago.
Melanerpes subelegans wagleri (SALVIN and GODMAN). Chiriqui, Panama, coast region of Colombia.
Melanerpes subelegans neglectus, RICHMOND. Bogota.

As type of this last, I will designate No. 47081, U.S.N.M., female adult; "Bogota;" Hon. A. A. Burton. Wing, 3.96; tail, 1.85; tarsus, 0.70; exposed culmen, 0.72 inches.—C. W. R.]

Family CAPRIMULGIDÆ.

42. CHORDEILES ACUTIPENNIS (Boddaert).

SOUTH AMERICAN NIGHT HAWK.

Native name "aguaita camino," i. e., road watcher, from its habit of flitting along the road at dusk and lighting in front of the traveler.

I flushed a few in rambling through the scrub near Porlamar, but secured only one. At El Valle I saw them flying overhead at early dawn, and they then looked exactly like our night hawk.

Family MICROPODIDÆ.

43. CHÆTURA CINEREIVENTRIS LAWRENCEI, Ridgway.

LAWRENCE'S SWIFT.

Abundant at El Valle shortly after daybreak, and again at sundown. One specimen secured.

[This specimen is quite like the type, but the wing is a bit shorter.—C. W. R.]

Family TROCHILIDÆ.

44. DOLEROMYA PALLIDA, Richmond.

BUFF-BREASTED HUMMING BIRD.

Doleromya pallida, RICHMOND, Auk, XII, October, 1895, p. 369.

The characteristic feature of the vegetation of the flat coast region of Margarita is the post cactus, the "cardón" of the natives, of which several species occur. These upright, spiny posts would appear to the stranger as productive of nothing that would sustain life, but such is not the case.

[1] Bull. Amer. Mus. Nat. Hist., IV, 1892, 55.

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One species in particular (*Cereus swartzii*, Grisebach) bears at uncertain points along its columnar stem globular fruit, some of which are as large as small peaches. When green, they are hard and so thickly beset with needle-like spines that they can not be picked up even when broken off and lying on the ground. But as they ripen, their color turns from green to dark red, the spines separate and fall off in little clumps, the skin of the fruit cracks like an overripe fig, drops of nectar begin to trickle forth, and are at once detected by the buff-breasted humming bird, who hastens to make a delicious meal. But other keen eyes are also on a lookout for the treat, and very soon the big troupial tears his way into the sweet pulp, the mocking bird, yellow oriole, grassquit, and black and yellow honey creeper take what he leaves, and the empty shell withers in the sun and falls to the earth. In a few days I learned that the birds were better judges of fruit than I, and whenever I saw a buff-breasted hummer poised before the fruit of a cardón, I at once knocked it down with my gun barrel and proceeded to enjoy it. When ripe, the outer skin is easily separated from the pulp, which is dark red and glutinous, thickly filled with small, black, seeds like grains of powder. The flavor is delicious, somewhat like strawberry with the acidity removed. The buff-breasted hummers eat not only the juice but also the flesh of this fruit, and this, with the little tuberose-shaped, wax-like, coral-red flowers of the melon cactus and the larger flowers of the tuna and cardones, constitute their food supply. They are not found where these do not occur in abundance, and they are therefore strictly limited to the coast region of Margarita.

On the second day after my arrival at Margarita I was hunting in the scrub when I heard the notes of a bird singing near at hand. I at first thought that it was the gnat-catcher, which was common thereabouts, but as it struck me that the song was louder than a gnat catcher's, I walked up quietly, and to my surprise discovered that it emanated from a humming bird. It is a great mistake to think that humming birds can not or do not sing. The *Amazilia aliciæ* has a well-marked and strong song of three notes, repeated a varying number of times, and the little *Chlorostilbon caribbæa* has a more varied though much weaker song, but the buff-breasted hummer is a nightingale compared to them. In singing they perch upon some prominent twig and elevate their beaks. The notes can be heard at a distance, and I quickly found that the easiest way to get specimens was to wait until one was heard singing and then go at once to the spot. In this way I secured some twenty, and could easily have gotten many more. As among the lot only two were females, I think that the males alone sing. On July 20 I found a nest with two eggs, incubated for a few days. It was saddled upon the branch of a small nettle bush only 2 feet from the ground, and was covered with lichens. The female sat with her tail high in the air and her wings beneath her tail. She was so fearless that she suffered me to photograph her on the nest, and afterwards lift her off with my hand, when she immediately returned to the eggs.

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[*Type*.—Male adult, No. 151069, U.S.N.M.; Margarita Island, July 5, 1895; Wirt Robinson; collector's No. 432. Similar to *D. fallax*, but much paler below, where pale buffy fulvous; metallic green of upper parts less brilliant and less brassy; size the same. Upper mandible and tip of lower, black; lower mandible flesh color. Wing, 2.41; tail (central feathers), 1.40; exposed culmen, 0.82 inches.

Female adult, No. 151070, U.S.N.M.; Margarita Island, July 4, 1895; same collector (No. 409). Does not differ from the male. Wing, 2.28; tail (central feathers), 1.34; exposed culmen, 0.85 inches.

Lieutenant Robinson collected over twenty specimens of this species, which I have compared with three specimens of *D. fallax* belonging to the American Museum of Natural History and kindly loaned for that purpose by Dr. J. A. Allen. They are uniformly paler than the three examples of *D. fallax*, and all, without exception, have pale flesh-colored lower mandibles, while those of *D. fallax* are apparently yellow when fresh. At any rate, the American Museum specimens have the appearance of having had yellow lower mandibles in life. There does not appear to be any appreciable variation in the amount of white on the outer tail feathers in *D. pallida*, and the area occupied by white on these feathers is the same in both species.

In both forms the feathers of the under parts are edged with buff, the less exposed part of the feathers being different shades of fulvous (light in *D. pallida* and darker in *fallax*), consequently, the more worn the plumage, the darker the birds appear. The majority of specimens of *D. pallida* are in somewhat worn plumage, while the three specimens of *D. fallax* are in quite fresh condition, hence the differences between the two species pointed out above will probably be greater when the two birds are compared in the same condition of plumage.—C. W. R.]

45. AMAZILIA ALICIÆ, Richmond.

ALICE'S HUMMING BIRD.

Amazilia aliciæ, RICHMOND, Auk, XII, October, 1895, p. 368.

The range of this brilliant humming bird is just the reverse of that of the preceding—that is, none at all were found in the coast region, and only a few in El Valle; but in ascending the heavily wooded mountains in rear, they became more abundant until when I had reached the perpetual clouds that hung about the peak and entered an atmosphere of mist, they were seen in all directions. The type specimen, a finely plumaged male, I shot from a mango tree as I sat in its shade drinking the milk of a cocoanut. It fell within a few feet of me and was at once seized by a wandering chicken which made off at full speed followed by me in hot pursuit. Fortunately there were no thorns to impede me, and although I broke down a banana plant in my headlong chase, I pressed the chicken so closely that it finally dropped my prize.

[*Type*.—Male adult, No. 151067, U.S.N.M.; Margarita Island, July

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4, 1895; Wirt Robinson; collector's No. 408. Forehead, forepart of crown, lores, ear-coverts, cheeks, sides of neck, and under parts brilliant metallic green; nape, under wing-coverts, and axillaries less metallic green, and of a brassy hue; hind crown, wing-coverts (except primary coverts, which have hardly a shade of metallic color), and back metallic reddish bronze, most intense on the latter, and almost disappearing on rump; upper tail-coverts pale chestnut, some of the feathers centered with purplish blue, which is visible only upon disturbing the feathers; under tail-coverts uniform pale chestnut, without any metallic centers to the feathers, and without admixture of whitish feathers; thighs and crissum silky white; flanks with a tuft of downy white feathers, which are normally concealed; wings blackish, with slight bluish reflections; tail blue black; upper mandible black, lower mandible flesh color except at tip, where black. Wing, 2.07; tail (outer feather), 1.27; depth of fork, 0.18; culmen, 0.80 inches.

Female adult, No. 151068, U.S.N.M.; Margarita Island, July 9, 1895; same collector (No. 483). Similar to the male, but duller; forecrown and forehead much less brilliant, and not sharply separated from the bronzy shade of hind crown; abdomen mostly dull dusky gray. Wing, 2.04; outer tail feather, 1.24; depth of fork, 0.16; culmen, 0.81 inches.

Lieutenant Robinson brought back eight specimens of this pretty bird, which is named in honor of Mrs. Robinson. It is closely allied to *Amazilia feliciæ* of the adjacent mainland, but is evidently distinct. I have been unable at this time to compare the new species with males of *feliciæ*, but, fortunately, Lieutenant Robinson stopped long enough at Laguayra to collect six females of the latter, which are of exceptional interest here, as they were collected at about the same time as those of the new form and are therefore in exactly the same state of plumage. Comparing females, then, the new form differs from *feliciæ* in having the posterior part of the crown and back reddish bronze instead of green; in having the rump and upper tail-coverts practically without metallic color; the tail less brilliant and steel black instead of blue black; under tail-coverts uniform pale chestnut, without any metallic green or steel blue feathers. This species is also larger than *A. feliciæ*. In the series of six females of the latter, the under tail-coverts are mixed chestnut and metallic green or steel blue, with occasional grayish feathers; the upper parts are brassy green in four of the specimens, a wash of bronze on the back of the fifth, and quite as pronounced bronze in the sixth as in specimens of *aliciæ*, but the bronzy appearance is probably due to a stain in this specimen, and covers more of the rump and upper tail-coverts than in specimens of *aliciæ*.

The sexes are easily separable in this species and from its close affinity to *A. tobaci*, *A. erythronota*, and *A. feliciæ*, the same is doubtless the case with them. The glittering green cap of the male sharply cut off from the duller remainder of the crown will at once distinguish it from the female.—C. W. R.]

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46. CHLOROSTILBON CARIBBÆA, Lawrence.

ATALA'S EMERALD.

Abundant in El Valle and around the plantations in rear, but very few seen in the coast region.

Humming birds which in Colombia are called "pica flores" or "chupa flores" (flower peckers or flower suckers), are called "colibrí" farther to the east, and at Laguayra "tocuso" or "tocusito." In Margarita, where the peculiarities of language amount almost to a dialect, these terms become "tocucho" and "tocuchito."

[Ten specimens from Margarita are indistinguishable from others of this species.—C. W. R.]

Family PIPRIDÆ.

47. CHIROXIPHIA LANCEOLATA (Wagler).

LANCE-TAILED MANAKIN.

Native names "comi toro" and "tintoro," from the fancied resemblance of their notes to these words.

They were abundant in the heavy forests in rear of El Valle and usually kept near the water courses. Their notes had a peculiar liquid and bell-like quality to them, like the lower tones of our wood thrush, and it was especially difficult to judge the distance and direction of the singer. At times the notes appeared double, and as I repeatedly saw a pair of males perched on the same branch and almost in contact, they may have been singing together, although in perfect unison. At Laguayra on July 25 I found a nest of this species. It was suspended in a fork of a stinging nettle, about 5 feet from the ground, and was so very shallow that I wondered why the eggs were not thrown out by the gentlest breeze. It contained two eggs, one addled and one on the point of hatching. They were large for the size of the bird and resembled the eggs of our red bird (*Cardinalis*).

Family TYRANNIDÆ.

48. MILVULUS TYRANNUS (Linnæus).

FORK-TAILED FLYCATCHER.

Native name "tijereta."

Abundant and coming in large numbers at early dawn to feed on the seeds of the copey. All that I saw were in badly worn plumage.

49. TYRANNUS DOMINICENSIS (Gmelin).

GRAY KINGBIRD.

The native name "pitíri," derived from its note, recalls at once the similar name, "pipiri," given by Audubon. They were common both along the coast and in the interior.

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50. TYRANNUS MELANCHOLICUS SATRAPA (Lichtenstein).

CROWNED KINGBIRD.

Common around El Valle, and associating with the fork-tailed flycatcher in feeding on the seeds of the copey.

51. MYIARCHUS TYRANNULUS (Müller).

BLACK-BILLED PETCHARY.

Common at all points on the island. At El Valle, on July 10, I found in a hollow in a small tree in an open field a nest of this species containing four fresh eggs. They cannot be distinguished from those of our great-crested flycatcher (*M. crinitus*), and as is the case with our bird the nest contained the cast skin of a snake.

[Six specimens are represented in the collection. These are referable to *M. tyrannulus*, rather than to Mr. Hartert's form *brevipennis*.—C. W. R.]

52. SUBLEGATUS GLABER, Sclater and Salvin.

VENEZUELAN FLYCATCHER.

Common in the scrub along the coast.

[Three specimens differ from Venezuelan and Trinidad birds only in being slightly smaller.—C. W. R.]

Family FORMICARIIDÆ.

53. THAMNOPHILUS DOLIATUS (Linnæus).

BARRED ANT SHRIKE.

Common in all parts of the island. Some of their notes resemble the distant cawing of crows. When scolding at an intruder, both male and female elevate their crests, which seem to spring just in rear of their nostrils and not from the crown of their heads, as in other birds.

[The specimens collected do not differ from those of the mainland or of Tobago. A female, apparently adult, has narrow subterminal black edges on the tertiaries, greater and primary wing-coverts, differing in this way from the numerous other females in our series.—C. W. R.]

54. FORMICIVORA INTERMEDIA, Cabanis.

INTERMEDIATE ANT WREN.

Common and often associated with the spine-tails, creeping about among dead brush and leaves. The young males have at first the plumage of the females and their breasts gradually become black in the same manner as the males of our black-throated green warblers. I found this bird abundant at Laguayra.

[The Margaritan specimens differ very slightly from those from Laguayra in having a slightly longer bill.—C. W. R.]

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Family DENDROCOLAPTIDÆ.

55. DENDROPLEX LONGIROSTRIS, new species.

MARGARITAN TREE CREEPER.

Abundant in all parts of the island. Their nests are constructed in the post cacti.

[*Type.*—Male adult, No. 151701, U.S.N.M.; Margarita, July 1, 1895; Wirt Robinson; collector's No. 374. Similar to *Dendroplex picirostris*, but with longer bill and shorter tail; feathers of throat, foreneck, sides of head and superciliary line uniform buffy white, without darker edgings; light centers of feathers of lower breast twice as broad as in *picirostris*. Wing, 3.88; tail, 2.97; tarsus, 0.87; exposed culmen, 1.20 inches. "Legs pale brownish green; irides brown."

The two specimens, male and female, represented in this collection have been compared with a National Museum specimen from Cartagena, and one from Bogotá loaned by the American Museum. The last is labeled "compared with type," and found to be "typical." Measurements of the four specimens are given below:

Measurements of Dendroplex picirostris and D. longirostris.

Museum.	Sex.	Locality.	Wing.	Tail.	Tarsus.	Ex. culmen.
			Inches.	*Inches.*	*Inches.*	*Inches.*
U.S.N.M	Adult	Cartagena	3.93	3.32	0.91	1.01
Am. Mus	do	Bogotá	3.86	3.19	.88	1.05
U.S.N.M	Male adult	Margarita	3.88	2.97	.87	1.20
Do	Female adult	do	3.91	2.87	.90	1.18

C. W. R.]

Family FURNARIIDÆ.

56. SYNALLAXIS ALBESCENS, Temminck.

WHITE-THROATED SPINE-TAIL.

Common in the scrub, but none seen in the forest land.

[Three specimens collected on Margarita appear to differ from various continental examples in having the throat and under parts purer white, under tail-coverts paler, shoulders and wing-coverts pale. Trinidad birds are pretty close to the Margaritan ones.—C. W. P

Family ICTERIDÆ.

57. ICTERUS ICTERUS (Linnæus).

TROUPIAL.

Native name "trupial" or "tropial," from its note.

These conspicuous and loud-voiced birds were abundant in the coast region, where they fed on the fruit of the cardón.

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58. ICTERUS XANTHORNUS (Gmelin).

YELLOW ORIOLE.

Native name "pespes."

Abundant in all parts of the island, except the heavy forest. Their long pendent nests were usually placed at the extremity of a waving leaf of a cocoa palm.

[The Margaritan specimens of *Icterus xanthornus* differ considerably in size from continental birds. There appears to be no difference in color, but the dimensions (except length of bill) are decidedly beyond the limit found in both the continental form and the Curaçao subspecies. The length of bill in the five specimens collected is intermediate between *xanthornus* and *curasoënsis*, but nearer the former. The wing and tail measurements of the two adult males from Margarita, two males from Curaçao, and several from various parts of its continental range, are given below:

Measurements of Icterus xanthornus.

Sex.	Locality.	Wing.	Tail.
		Inches.	*Inches.*
Male adult	Demerara	3.54	3.30
Do	Venezuela	3.53	3.18
Do	Santa Marta	3.59	3.43
Do	Brazil	3.61	3.34
Do	do	3.46	3.13
Do	Margarita	3.90	3.55
Do	do	3.80	3.55

Measurements of Icterus xanthornus curasöensis.

Sex.	Locality.	Wing.	Tail.
		Inches.	*Inches.*
Male adult	Curaçao	3.65	3.37
Do	do	3.59	3.41

C. W. R.]

59. QUISCALUS INSULARIS, new species.

MARGARITAN GRACKLE.

Native name, "angoleta."

Very abundant, especially near Porlamar, where they entered the yards in rear of the houses and even ventured upon our dining table in search of crumbs. At certain hours of the day they assembled in flocks of several hundred individuals and frequented heaps of partly decayed seaweed tossed up on the beaches.

[*Type.*—Male adult, No. 151733, U.S.N.M.; Margarita, July 3, 1895; Wirt Robinson; collector's No. 407. Similar to *Q. lugubris*, but larger; no difference in color in the male. Wing, 4.72; tail, 3.98; tarsus, 1.31; exposed culmen, 1.13 inches. "Irides pale yellow."

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The female differs from the same sex in *Q. lugubris* in the much lighter, brownish gray color on throat, gradually passing away on breast and sides of body. The back and head are also lighter than in *Q. lugubris*. The color and pattern of coloration are very similar to those of the female of *Molothrus ater*, but are slightly darker. The wing, tail, and culmen in both sexes are longer than in *Q. lugubris*. We have no specimens of the latter, and my comparison has been with four specimens belonging to the American Museum of Natural History. Measurements of these specimens, and of the three collected by Lieutenant Robinson, are here given:

Measurements of Quiscalus insularis and Q. lugubris.

Sex.	Locality.	Wing.	Tail.	Tarsus.	Culmen.
		Inches.	*Inches.*	*Inches.*	*Inches.*
Male adult	Margarita	4.76	3.89	1.31	1.11
Do	do	4.72	3.96	1.31	1.13
Female adult	do	4.01	3.17	1.12	1.02
Male adult	Trinidad	4.42	3.40	1.24	1.05
Do	British Guiana	4.31	3.58	1.25	1.04
Do		4.35	3.58	1.31	1.01
Female adult	Trinidad	3.88	3.13	1.13	.93

C. W. R.]

Family FRINGILLIDÆ.

60. CARDINALIS ROBINSONI, Richmond.

ROBINSON'S CARDINAL.

Cardinalis robinsoni, RICHMOND, Auk, XII, October, 1895, 370.

Native name "guayamate."

Common in the coast region. Their song does not resemble that of our cardinal.

[*Type.*—Male adult, No. 151072, U.S.N.M.; Margarita Island, July 8, 1895; Wirt Robinson; collector's No. 460. Similar to *C. phœniceus* but smaller, with considerably shorter crest. Apparently no difference in color. Wing, 3.26; tail, 3.29; tarsus, 0.96; culmen, 0.76; length of crest, 1.17 inches.]

The female, of which two specimens are in the collection, differs similarly in dimensions.

The two females are pale creamy buff below, slightly darker ochraceous on flanks and sides of body. The single female of *C. phœniceus* at hand for comparison is deep ochraceous buff below, with the middle of the abdomen buff. This apparent difference in color between the females of the two forms may be due to the condition of plumage in the specimens examined, those of *C. robinsoni* being in worn and that of *C. phœniceus* in fresh plumage.

One of the females of *C. robinsoni* differs from the other, and from the female of *C. phœniceus*, in having the scarlet vermilion of the crest, under part of wing and tail replaced by ochraceous yellow; it is otherwise quite similar.

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Measurements of a pair of *C. phœniceus* from Lake Maracaibo and of five specimens of *C. robinsoni* are here given:

Measurements of Cardinalis phœniceus.

Sex.	Locality.	Wing.	Tail.	Tarsus.	Ex. culmen.	Length of crest.
		Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Male adult	Lake Maracaibo.....	3.45	3.60	0.94	0.73	1.63
Female adult ..	.....do	3.33	3.53	.97	.71	1.43

Measurements of Cardinalis robinsoni.

Sex.	Locality.	Wing.	Tail.	Tarsus.	Ex. culmen.	Length of crest.
		Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Male adult.....	Margarita Island.....	3.26	3.29	0.96	0.76	1.17
Do.....	.....do	3.20	3.20	.95	.69	1.13
Do.....	.....do	3.20	3.10	.95	.70	1.18
Female adult..	.....do	3.13	3.06	.91	.69	1.11
Do.....	.....do	3.20	3.13	.99	.73	1.25

C. W. R.]

61. VOLATINIA JACARINI SPLENDENS (Vieillot).

GLOSSY GRASSQUIT.

I saw at El Valle perhaps a half dozen individuals. As in the case of *Tachyphonus melaleucus*, the white shoulder patches become hidden in made-up skins.

62. EUETHEIA OMISSA (Jardine).

VENEZUELAN GRASSQUIT.

Plentiful in the scrub near the coast.

[This is the form represented on Margarita. A male from this island and one from Laguayra are very much alike, except that the under tail-coverts in the former are blackish, with light olive grayish edgings, while in the latter these are broadly edged with yellowish white. In other respects they are quite similar.—C. W. R.]

Family TANAGRIDÆ.

63. TACHYPHONUS MELALEUCUS (Sparrman).

BLACK AND WHITE TANAGER.

A good many of these tanagers came to feed on the seeds of the copey.

64. TANAGRA PALMARUM MELANOPTERA (Hartlaub).

BLACK-WINGED PALM TANAGER.

Native name "chiquía," from its note.

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65. TANAGRA GLAUCOCALPA (Cabanis).

GLAUCOUS BLUE-WINGED TANAGER.

Native name "azulejo."

These two tanagers were equally abundant around El Valle. Their favorite food was the ripe papaya fruit, but they also fed on mangoes and copey seeds.

[Between two Margarita examples and two from Sabanilla, Colombia, there is some color difference, the former being somewhat brighter blue on breast and sides, and brighter in color generally, which, however, may be due to their fresh condition, the other specimens being old skins. The Margaritan examples are slightly larger, with more robust (but not longer) bills. The differences in dimensions may be seen in the following table:

Measurements of Tanagra glaucocalpa.

Sex.	Locality.	Wing.	Tail.	Culmen.
		Inches.	*Inches.*	*Inches.*
Male adult	Margarita	3.52	2.49	0.57
Female adult	do	3.45	2.50	.59
Adult	Sabanilla	3.23	2.32	.57
Do	do	3.39	2.41	.57

C. W. R.]

Family HIRUNDINIDÆ.

66. PROGNE CHALYBEA (Gmelin).

STEELY-BACKED MARTIN.

Native name, "golondrina."

A large colony of these had their nests under the tiles of the houses in Porlamar, and a second colony nested in the church at El Valle.

Family VIREONIDÆ.

67. VIREO CHIVI AGILIS (Lichtenstein).

AGILE VIREO.

Common in the forests around El Valle. Its resemblance to a highly colored red-eyed vireo is strengthened by a portion of its song, which is indistinguishable from that of our bird.

[A single specimen in the collection appears to be perfectly typical.—C. W. R.]

68. HYLOPHILUS GRISEIPES, new species.

GRAY-FOOTED HYLOPHILUS.

This little vireo was common in the coast region and was usually found in the cactus hedges bordering the road, where its actions seemed much like those of our Maryland yellow throat.

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[*Type.*—Male adult, No. 151741, U.S.N.M.; Margarita, July 3, 1895; Wirt Robinson; collector's No. 401.

Upper parts olive green, clearer greenish on rump and upper tail-coverts, with a grayish wash, particularly on top of head; tail similar, edged externally with lighter green, inner webs of most of the feathers narrowly edged with yellowish green; primaries blackish brown, becoming lighter on secondaries and tertiaries, which latter are similar in color to the tail, and bordered on outer webs with greenish like outer webs of the rectrices; wing-coverts similar to the back; bend of wing, axillaries, under wing coverts, inner webs of quills (except at tips), and under tail-coverts bright light yellow, deepest on axillaries, and least so on under tail-coverts. Throat grayish white; center of breast and sides of abdomen creamy buff; center of abdomen buffy silky white; sides of breast, body, and flanks greenish buff; superciliary line grayish buff; lores, sides of forehead, near bill, and sides of head grayish white. Bill blackish, paler at base of lower mandible; legs and "feet grayish-lead." Wing, 2.05; tail, 1.69; tarsus, 0.67; exposed culmen, 0.43; exposed portion of first primary, 0.74 inches. A second male measures: Wing, 2.12; tail, 1.59; tarsus, 0.68; exposed culmen, 0.39; exposed portion of first primary, 0.68 inches.

This species appears to be most closely related to *H. flavipes*, but is smaller, without the yellowish bill and feet, and lacks the yellowish tinge on the under parts, superciliary line, forehead, lores, etc. It has the dark feet of *aurantiifrons*, but differs from it very decidedly in other respects. It is also apparently quite different from *H. ferrugineifrons* and *H. luteifrons* of Sclater.

C. W. R.]

Family COEREBIDÆ.

69. COEREBA LUTEOLA Cabanis).

VENEZUELAN HONEY CREEPER.

Common in the scrub, feeding principally on the fruit of the cardón.

[Two males from Margarita do not differ from others of this species.—C. W. R.]

70. ARBELORHINA CYANEA EXIMIA (Cabanis).

VENEZUELAN GUIT-GUIT.

The native name of this beautiful little bird, "copeicillo," is given because it feeds almost entirely on the seeds of the copey.

At certain hours of the day they swarmed in the tree tops. In specimens from Margarita the beak is nearly one-third longer than in others from various parts of its Central and South American range, and this variation might possibly be accounted for from the fact that, being unable to tear the thick rind of the copey fruit, they must depend

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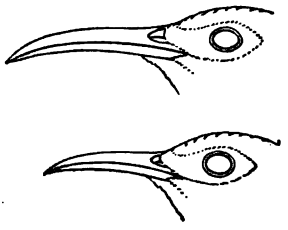
upon reaching the seeds in the narrow clefts by means of their slender and long beaks.

[A series of thirteen specimens from Margarita present the characters claimed for this subspecies very clearly. The accompanying figure, representing an average Central American bird, and also the longest-billed Margaritan specimen, will show the great difference in length of bill between the two forms. Specimens of *A. c. eximia* from the mainland of Venezuela (from whence the form was originally described) are not, judging from the material in the U. S. National Museum collection, very constant in regard to the characters of this subspecies, some of the specimens from that country being very close to the true *cyanea*. There is also a wide variation in length of bill in specimens from Trinidad and Tobago, where *eximia* appears to occur.



HEADS OF AMBLORHINA CYANEA EXIMIA AND A. CYANEA.

The average length of the exposed culmen in ten males from Margarita is 0.82 inch, the extremes being 0.73 and 0.90 inch. Dr. J. A. Allen gives the average length of exposed culmen in fifteen males from Matto Grosso, selected at random, as 0.54 inch, with extremes of 0.48 and 0.59 inch, these figures all falling considerably below the minimum measurement in the Margaritan males.

In three Margaritan females the exposed culmen averages 0.78 inch, with 0.85 and 0.64 inch as extremes, the last being much the shortest of the entire series. In nine males the wing measurements average 2.56 inches, with extremes of 2.48 and 2.70 inches; the fifteen males measured by Dr. Allen average 2.68 inches, with extremes of 2.57 and 2.76 inches.

The Margaritan birds do not differ in color from those of other localities, and in this respect individuals from one end of the bird's range to the other are remarkably uniform.—C. W. R.]

Family MIMIDÆ.

71. MIMUS GILVUS (Vieillot).

GRACEFUL MOCKING BIRD.

Native name "paraulata."

With the exception of the scaled dove, this was the most abundant bird on the island, being found everywhere except in the heavy forest. On July 15 I found a nest with three partly incubated eggs which were indistinguishable from those of our mocking bird.

[In three specimens from Margarita the length of the exposed culmen varies from 0.75 to 0.85 inch, giving the birds a place intermediate between *gilvus* and *rostratus*.—C. W. R.]

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Family SYLVIIDÆ.

72. POLIOPTILA PLUMBICEPS, Lawrence.

LAWRENCE'S GNATCATCHER.

Polioptila plumbiceps, LAWRENCE, Proc. Acad. Sci. Phil., 1865, 37.

Abundant at all points on the island, its habits closely resembling those of our gnatcatcher.

[Five specimens, including two males, were collected at Laguayra and Margarita. These are sufficiently distinct from *P. nigriceps* of western Mexico to deserve a name, and *P. plumbiceps* of Lawrence, although a misnomer, is the only available name I have been able to find. This species was based on a female or young male from Venezuela, and was thought by Mr. Lawrence to represent a fourth section of the genus, having the entire crown dark plumbeous. The adult male has, however, as black and glossy a cap as *P. nigriceps*. From the type and two other specimens of *P. nigriceps* the present specimens differ in having considerably shorter tails (average about 0.30 inch), wing and tarsus also a trifle shorter, and in having slightly broader bills. The white edging on the outer webs of tertiaries is prominent in the Venezuelan and Margaritan specimens. The black base of the outer tail feather may end obliquely or transversely (as in two females from Laguayra), but in three of the specimens is slightly oblique, and in all of the specimens is concealed by the under tail-coverts.—C. W. R.]

Family TURDIDÆ.

73. PLATYCICHLA CARBONARIA (Lichtenstein).

YELLOW-BILLED THRUSH.

Beak, feet, and lids gamboge yellow, skin around eye yellowish. I saw only two individuals and they were in the heavy forest up in the region of perpetual mist.

II. BIRDS OBSERVED AT GUANTA, VENEZUELA.

On the return trip from Margarita to Laguayra our steamer stopped for a few hours on July 2 to take on coal at Guanta, a port 12 miles east of Barcelona. The harbor is almost landlocked and thoroughly protected on three sides by high hills. It has a commodious wharf erected by an English company operating a railroad from Guanta to Barcelona, and thence some miles farther into the interior to a coal mine, whence the company is obtaining a good supply of coal. The hills surrounding the harbor are fairly well clothed with trees, and the shores are thickly fringed with mangrove swamps, which, owing to the breeze being shut off by the hills, reek with malaria. At the back of the harbor there is a flat valley, down which a tortuous stream creeps sluggishly in a

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bed of tenacious blue mud. This valley contains a very extensive cocoanut grove, with plantains growing beneath the trees. In the mud at the foot of these trees large blue crabs (*Cardisoma guanhumi*, Latreille) have their burrows, and sit, like spiders, watching for prey. They made off with two of the birds that I shot before I could reach them. The little red squirrels (*Sciurus æstuans hoffmanni*), the "arditos" of the natives, are abundant here. I spent about two hours in this grove with my butterfly net and my gun, and was kept busy. Birds were seen in every direction and in the greatest abundance; pigeons, doves, parrakeets, flycatchers, caracara eagles, hawks, delicate little swallow-tailed swifts (*Panyptila cayennensis?*) flying high in the air, and no less than eight different species of humming birds. The following is a very imperfect list of my observations:

1. SULA, sp.

2. PELECANUS FUSCUS, Linnæus.

3. LEPTOTILA, sp.

4. COLUMBIGALLINA PASSERINA (Linnæus).

5. SCARDAFELLA, sp.

6. CATHARISTA ATRATA (Bartram).

7. POLYBORUS CHERIWAY (Jacquinot).

8. CONURUS, sp., probably C. ÆRUGINOSUS.

9. CROTOPHAGA ANI, Linnæus.

10. PANYPTILA CAYENNENSIS?

11. GLAUCIS HIRSUTUS (Gmelin).

12. PHÆTHORNIS, sp.

13. HYPUROPTILA BUFFONI (Lesson).

14. FLORICOLA LONGIROSTRIS (Vieillot).

15. AGYRTRIA VIRIDISSIMA (Lesson).

16. AMAZILIA FELICIÆ (Lesson).

17. CHLOROSTILBON CARIBBÆA, Lawrence.

18. HELEODYTES NUCHALIS (Cabanis).[1]

The large wrens (*Heleodytes nuchalis*) were especially abundant in marshy thickets along the little stream. They were very voluble, and were continually spluttering out a magnified edition of the bubbling song of our little marsh wren. Like our marsh wrens, they seem to build surplus nests, for I found no less than six in one small bush. The nests of cocoa palm fiber, lined with hair and feathers, are covered

[1] Fresh colors of a female collected are: Irides yellowish white; legs light lead; beak brownish above, flesh below.

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over and have two openings. I found several nests with eggs; one contained eight fresh eggs, most of which were white, but some faintly spotted with reddish brown.

III. BIRDS OBSERVED AT LAGUAYRA, VENEZUELA.

I spent altogether ten days at Laguayra, June 20 to 27 and July 23 to 26, but finding the birds in very poor plumage, I obtained only some thirty skins and confined myself to insects.

The lofty mountains in rear of Laguayra descend precipitately into the sea, having at their feet a narrow strip of fairly level ground, in some places barely 100 yards wide. The lower portions of these mountains are scantily clad with a growth of scrubby thorn trees and cactus, but near their summits, where the needed moisture is furnished by the condensation of clouds, there are heavy forests. Such is the steepness of the mountain slopes that these forests are practically inaccessible. However, at a few spots streams find their way down to the sea, and by ascending the ravines which serve as their beds, one can penetrate to some distance from the coast. Such a stream is found three-quarters of a mile east of the town, and in my daily excursions I usually followed up its course for probably a couple of miles, where progress was stopped by almost perpendicular slopes. The ravine was well wooded and bird life was abundant, as it was also around the edges of the fields on the flat coast strip. High up in this ravine I caught a small light-colored crab (*Pseudothelphusa*), which lived in burrows among the roots of trees, and which has proved to be a new species. I also got a number of lizards and snakes here, and found butterflies in great abundance, especially the *Heliconias*, *Callidryas*, and *Ithomias*. This was the only spot where I found *Morphos* and *Calligoes*, but they were all badly tattered and worn.

The number of birds that I identified is but small in proportion to those that I observed. The following is therefore a very imperfect list of the birds of the vicinity of Laguayra:

1. **STERNA**, sp.

Abundant.

2. **PELECANUS FUSCUS**, Linnæus.

Abundant.

3. **FREGATA AQUILA** (Linnæus).

Abundant.

4. **EUPSYCHORTYX**, sp.

A pair seen.

5. **LEPTOTILA**, sp.

Many seen.

6. **COLUMBIGALLINA PASSERINA** (Linnæus).

Abundant.

7. **CATHARTES AURA** (Linnæus).

Abundant.

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8. CATHARISTA ATRATA (Bartram).

Abundant.

9. CROTOPHAGA ANI, Linnæus.

Abundant.

10. COCCYZUS MELANOCORYPHUS, Vieillot.

One obtained.

11. CERYLE AMERICANA (Gmelin).

One seen.

12. MELANERPES, sp.

One shot.

13. CHÆTURA, sp.

Abundant.

14. GLAUCIS HIRSUTUS (Gmelin).

One seen.

15. HYPUROPTILA BUFFONI (Lesson).

A pair obtained.

16. AMAZILIA FELICIÆ (Lesson).

Abundant.

17. CHLOROSTILBON CARIBBÆA, Lawrence.

Abundant; some young males obtained in June in an intermediate stage of plumage.

18. THAMNOPHILUS DOLIATUS (Linnæus).

Common.

19. FORMICIVORA INTERMEDIA, Cabanis.

Abundant.

20. CHIROXIPHIA LANCEOLATA (Wagler).

Common in the forest.

21. POGONOTRICCUS,[1] sp.

One shot.

22. PLATYRHYNCHUS MYSTACEUS INSULARIS,[2] Allen.

One skin obtained.

23. TODIROSTRUM CINEREUM (Linnæus).

Common.

24. QUISCALUS, sp.

Common.

[1] [This specimen is immature, and so different from the adults of any of the known species that I am unable to identify it. In color it somewhat resembles *Sublegatus glaber*, but the wing bars are tinged with buffy brown instead of white.—C. W. R.]

[2] [A specimen with a slight coronal patch, marked female, agrees in this respect with several females collected in Trinidad by Mr. Chapman. This example is very close to Trinidad birds, but is darker green on the upper parts, the wings are less brown, the wing bars are lighter, the ear-coverts and orbital ring are clearer yellow, and the abdomen is also clearer and lighter yellow. These differences are not very pronounced, however. The type female from Tobago is somewhat lighter on the back than Trinidad examples, and the latter bear the same relation to the Laguayra specimen. The last named is the farthest removed from *P. mystaceus* from Brazil, and also from the type of *insularis*.—C. W. R.]

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25. VOLATINIA JACARINI SPLENDENS (Vieillot).

Common.

26. EUETHEIA OMISSA (Jardine).

Abundant.

27. TACHYPHONUS MELALEUCUS (Sparrman).

Common.

28. TANAGRA CANA?

Common.

29. PROGNE CHALYBEA (Gmelin).

Common.

30. ATTICORA CYANOLEUCA (Vieillot).

Abundant.

31. VIREO CHIVI AGILIS (Lichtenstein).

Common.

32. COEREBA LUTEOLA (Cabanis).

Common.

33. POLIOPTILA PLUMBICEPS, Lawrence.

Common.

34. THRYOTHORUS RUTILUS, Vieillot.

One obtained.

35. TROGLODYTES RUFULUS, Cabanis.

This species is common, nesting in the crevices among the leafstalks of the cocoa palms. Its song is almost exactly the same as that of our house wren.

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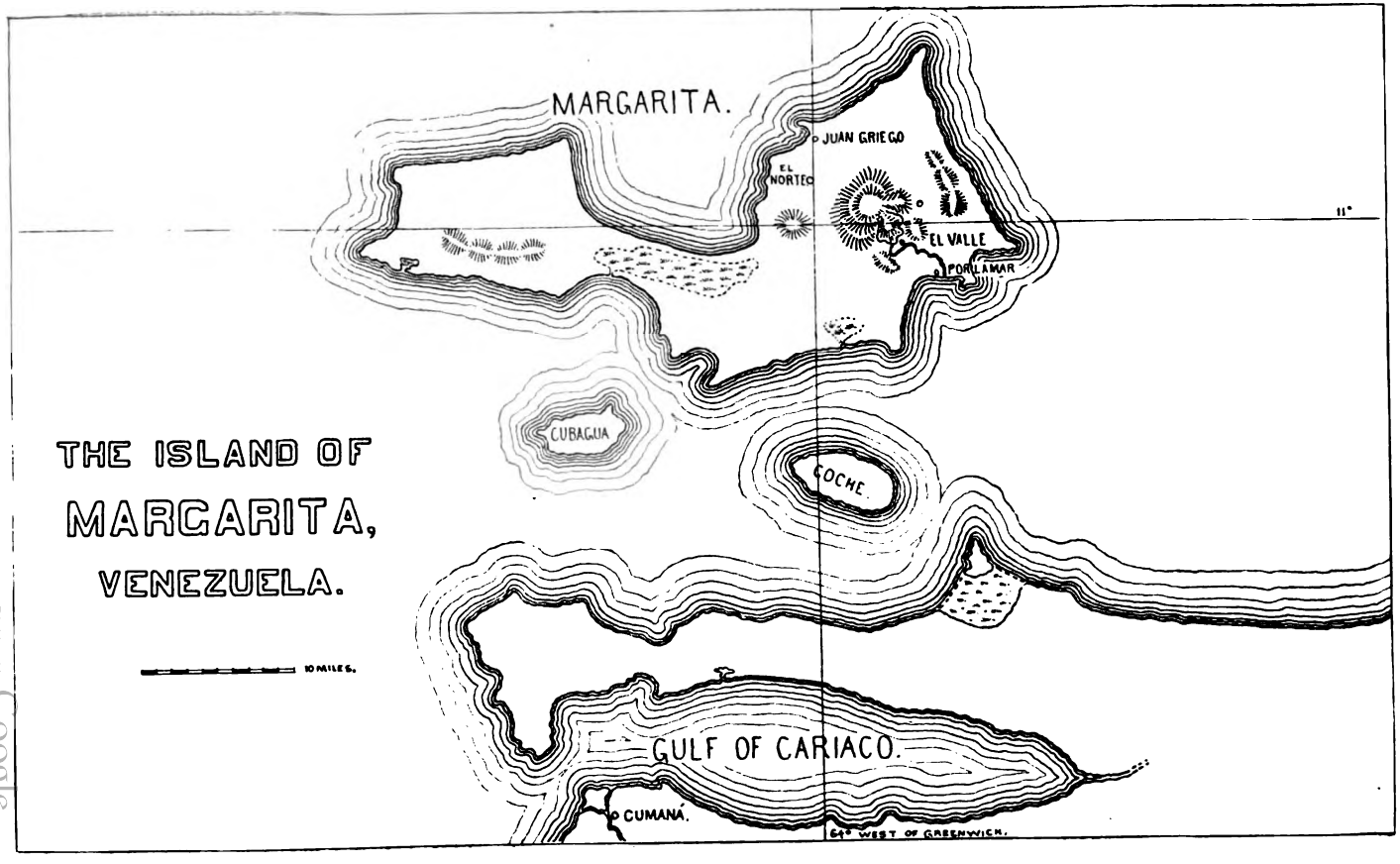

THE ISLAND OF
MARGARITA,
VENEZUELA.

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LIST OF COLEOPTERA COLLECTED ON THE TANA RIVER, AND ON THE JOMBENE RANGE, EAST AFRICA, BY MR. WILLIAM ASTOR CHANLER AND LIEUTENANT LUDWIG VON HÖHNEL, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES.

By MARTIN L. LINELL,
Aid, Department of Insects.

DURING the East African expedition of Mr. Chanler and Lieutenant von Höhnel, in 1893 from the coast to Hameye, along the River Tana, 149 species of Coleoptera were collected. In 1894, on their expedition to Jombene Range, northeast of Mount Kenia, the same gentlemen collected 45 species, out of which only three proved identical with those obtained on their first expedition. It may be of interest to publish a systematic list of these species, with descriptions of such new forms, 34 in number, that apparently have not yet been classified in entomological literature. In four instances it has been found necessary to erect new genera.

POLYHIRMA CHANLERI, new species.

Elongate, black, feebly shining; antennæ with the three basal joints griseopilose, the others obscure, compressed, subcarinate. Front deeply and broadly bisulcate; the sulci straight, with long, appressed, yellowish gray hairs. Vertex broadly bifoveate, hairy. Thorax elongate, cordate, margined at sides, densely punctured; disk with two stripes of black, short, erect hairs; the broad median channel and the sides with long, transversely appressed, yellowish hairs; a long, deep basal fovea each side; posterior angles obtuse. Elytra elongate, strongly narrowed at base, broadest behind the middle, obliquely truncate at the apex and with the suture produced, forming a slight emargination; disk with short, black, suberect hairs and with two whitish gray spots each side, the first pair a little before the middle on the third interval, longitudinally oval, surrounding a large fovea; the second pair a little larger, oblique, at apical fourth, on the fourth to the seventh interval; a short scutellar stripe, and the lateral margin, with long, appressed, yellowish gray hairs, the former reaching only one-fourth the length of the elytra, the latter dilated toward the apex; striæ deeply and coarsely

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punctured on the basal half, more finely at the sides and almost obliterated toward the apex; the second, fourth, and sixth intervals acutely carinate from base beyond the middle. Ventral surface and legs sparsely griseopilose.

Type.—No. 16, U.S.N.M. Three examples, Tana River. Length, 25 mm.

This species resembles *Polyhirma polioloma*, Chaudoir, in the form of head and thorax, and *Polyhirma alternata*, Raffray, in the elytral sculpture. The maculation of the elytra is peculiar.

PSEPHUS HOEHNELI, new species.

Fusiform, uniformly brown, shining, sparsely covered with long pale hairs. Antennæ ferruginous, feebly serrate, the third joint equal to the fourth, in the male nearly reaching the apex of the posterior angles of the thorax, in the female somewhat shorter. Front convex, with broadly rounded margin, densely and coarsely punctate, the punctures ocellate. Thorax somewhat longer than broad, gradually narrowed from base, rounded at anterior angles, coarsely punctate, more densely at sides, punctures ocellate; a broad median channel from base to middle, where it abruptly ends; base transversely and deeply impressed at the sides; posterior angles not divergent, carinate. Elytra as broad as thorax, parallel for two-thirds of the length, deeply punctato-striate; intervals slightly convex, coarsely and muricately punctate, somewhat transversely scabrous. Ventral surface densely but more finely punctulate. Legs ferruginous.

Type.—No. 17, U.S.N.M. Three examples, Tana River. Length, 14 to 15 mm.

PLACOCERUS FULVUS, new species.

Elongate, fulvous above with short fulvous pubescence and sparse, long, erect, black hairs. Ventral surface, antennæ, and legs bluish black, with long, grayish and black hairs. Front with two deep fulvotomentose impressions, separated by a longitudinal black carina; vertex with a broad black stripe; eyes moderately granulate, emarginate in front, with long, black hairs, and on posterior half covered with very dense short, yellow pubescence; mandibles long, strongly curved, acute, black; maxillary palpi black, with terminal joint lanceolate, yellow at the apex; labial palpi much longer, pale yellow, with terminal joint black, longer than second, broadly dilated toward apex, strongly compressed, apical margin convex. Antennæ longer than head and thorax; first joint stout, a little curved, twice longer than broad; second small, transverse; third wider, triangular; fourth to eleventh strongly dilated, forming an almost continuous flat disk, about five times as long as wide, broadest at sixth and seventh joints; last joint longer than broad, rounded at tip, fourth to tenth transverse. Thorax somewhat broader than long, strongly constricted at base and apex, with three black

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dorsal stripes, the middle one broader, entire, the others abbreviated at either end. Elytra nearly twice broader than thorax, strongly punctato-striate, punctures transverse, closely placed; intervals narrow, finely rugose.

Type.—No. 18, U.S.N.M. One example, Jombene Range. Length, 10 mm.

ORPHNUS THORACICUS, new species.

Oval, convex, rufo-castaneous, polished. Head very short, sparsely punctulate; clypeal margin reflexed, serrate; front with a strong, suberect, conical horn at middle and a short carina at inner margin of the eye. Thorax strongly transverse, continuously margined; anterior angles acute, posterior obtuse, nearly rounded; base truncate; disk deeply and broadly excavate from the anterior margin three-fourths of the length toward base; excavation bilobed behind; the sides in front strongly conically elevated; a few coarse punctures on the sides of the disk. Scutellum semioval, smooth. Elytra twice as long as thorax, broadly conjointly rounded at apex; humeri prominent; disk with short irregular striæ of coarse punctures near the scutellum and around the humeral umbones; sutural stria obsolete. Ventral surface sparsely hirsute. Anterior tibiæ strongly tridentate; spurs of posterior tibiæ long, reaching the apex of second tarsal joint.

Type.—No. 19, U.S.N.M. One example, Tana River. Length, 5.5 mm.

SERICA CONSIMILIS, new species.

Broadly oval, dark ferruginous, sericeous, somewhat shining, rather densely punctate, rufo-ciliate at sides. Antennæ ten-jointed, light ferruginous; club three-jointed, somewhat longer than the stem. Clypeus separated from the front by an obtusely elevated, strongly arcuate line, densely punctate, with apical margin truncate, obsoletely tridentate. Thorax evenly convex, twice broader than long, widest at base, slightly narrowed to middle, strongly obliquely convergent in front; anterior angles produced, posterior angles obtuse. Scutellum triangular, smooth at apex. Elytra at base broader than thorax, somewhat wider at middle, broadly rounded at apex, rather strongly punctatostriate; sutural stria more deeply impressed posteriorly; intervals irregularly punctate, slightly convex. Pygidium convex, punctate. Ventral surface and legs ferruginous, tarsi darker. Anterior tibiæ strongly bidentate. Claws all equally cleft.

Type.—No. 20, U.S.N.M. One example, Tana River. Length, 9 mm.

SERICA NITIDIROSTRIS, new species.

Broadly oval, convex, light ferruginous, sericeo-opaque, vaguely rugosopunctate. Antennæ testaceous, ten-jointed; club four-jointed, somewhat longer than the stem, the first lamella only one-fifth as long as the others. Clypeus very shining, coarsely cribrose, separated from front by an elevated, arcuate line; rather strongly reflexed at apex,

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slightly emarginate. Thorax uniformly convex, twice broader than long, surrounded with a narrow black margin and with a small round black spot on each side of disk; sides fimbriate with long red hairs, convergent from base, rounded in front; posterior angles obtuse, anterior angles slightly produced. Scutellum triangular, narrowly margined with black. Elytra fimbriate at sides, gradually widened from the base, broadly rounded at the apex, distinctly punctato-striate; suture narrowly black. Pygidium almost flat, obsoletely rugulose. Ventral surface obsoletely rugose; posterior coxæ strongly punctate. Legs lined with black; posterior tarsi infuscate; anterior tibiæ strongly bidentate; claws all equally cleft.

Type.—No. 21, U.S.N.M. One example, Tana River. Length, 8 mm.

TROCHALUS SUBROTUNDUS, new species.

Broadly oval, subglobose, brownish black, iridescent. Head irregularly deeply punctate; lateral margins strongly reflexed, broadly subsinuate before the eyes, strongly convergent; clypeus distinctly separated from the front by an arcuate elevated line, deeply constricted before the apex, and with a short, acute median carina; labrum reflexed, bisinuate, subbidentate. Antennæ ferruginous, ten-jointed; club three-jointed, longer than the stem. Thorax evenly convex, densely and strongly punctate; sides marginate, broadly rounded, strongly convergent, with the anterior angles acute, posterior angles obtuse; base broadly lobed at middle. Scutellum large, triangular, rather densely punctured. Elytra more distinctly iridescent, truncate at the apex, finely punctato-striate on the disk, very obsoletely toward the sides; intervals coarsely but vaguely punctate, obliquely subrugose. Pygidium convex, very shining, rufopiceous, sparsely and strongly punctate. Ventral surface shining, rufopiceous, sparsely and strongly punctate. Legs rufous. Anterior tibiæ bidentate.

Type.—No. 22, U.S.N.M. Two examples, Tana River. Length, 7 mm.

PEGYLIS RUFOMACULATUS, new species.

Oval, reddish brown, finely and sparsely pubescent; above coarsely punctate, with fine distinct punctures intermixed; pygidium and ventral surface finely rugose. Antennæ ten-jointed; club three-jointed, as long as the stem. Clypeus rugose, entire, rounded, with the margin reflexed; frontal carina distinct, straight. Thorax very short, broadest at middle; sides strongly rounded, obliquely convergent toward apex; anterior angles obtuse but somewhat prominent, posterior angles nearly rounded; disk canaliculate at middle with a round impression each side; base broadly bisinuate; scutellum broad, semioval, finely punctulate, and with a few coarse punctures each side. Elytra reddish, variegated with large black spots; sides rounded, broadly dilated at middle; suture distinctly elevated; two obsolete dorsal carinæ. Anterior tibiæ strongly bidentate. Claws cleft at tip, the superior part longer.

Type.—No. 23, U.S.N.M. One example, Tana River. Length, 16 mm.

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SCHIZONYCHA LONGITARSIS, new species.

Oblong, parallel, rufotestaceous, shining. Head broad, black; clypeus reddish, reticulately punctured, with margin broadly reflexed, rounded at sides, subemarginate at middle; frontal carina arcuate, abbreviated near the eyes; front flattened, submuricately punctured; vertex without carina, smooth, posteriorly with a few coarse punctures. Thorax twice broader than long, unevenly convex, narrowed in front; side margins depressed, strongly rounded, subcrenulate; anterior angles rounded, posterior angles obtuse; base broadly bisinuate; disk more or less infuscate, irregularly, sparsely punctate, punctures ocellate. Scutellum triangular, smooth, coarsely punctate at sides. Elytra at base as broad as thorax, subangulately explanate just before middle, evenly and rather densely, rugosely punctate, each puncture with a small scale; suture and margin narrowly infuscate. Pygidium smooth at middle, a few coarse punctures at sides. Ventral surface with sparse, setigerous punctures. Antennæ nine-jointed. Legs very long; anterior tibiæ strongly tridentate; claws dentate at base, cleft at tip with the superior part shorter, very thin.

Male.—Antennal club longer than the stem. Tarsi, especially on the anterior legs, strongly elongate. Posterior tibial spurs dissimilar, the outer one large, flat, lanceolate; the inner one short, strongly curvate. Last ventral segment with a triangular impression, deeply canaliculate at middle. Pygidium deplanate at middle.

Female.—Tarsi less elongate. Antennal club much shorter than stem. Last ventral segment convex, semicircularly emarginate at apex. Pygidium very strongly excavate at middle, more deeply toward apex. Posterior tibial spurs subequal.

Types.—No. 24, U.S.N.M. Four males and one female, Tana River. Length, 15 mm.

ANOMALA CRASSA, new species.

Ovate, convex, glabrous, shining black. Head broader than long, rugosely punctate; clypeus rounded, with broadly elevated, entire margin; eyes large, globose; antennæ dark ferruginous, club longer than the stem. Thorax one-half broader than long, narrowed in front, continuously margined, finely and sparsely punctulate, with a large, round, deeply impressed fovea, equidistant from base and apex on each side toward the margin; color clear reddish brown, with a broad median stripe and a large round spot each side shining black. Scutellum subtriangular, black, sparsely punctulate. Elytra black or reddish brown, with sides rounded, broadest just before middle, strongly punctatostriate; second interval broader, coarsely irregularly punctate, the others subequal, smooth; scutellar impression wanting. Pygidium more or less red, slightly, transversely, rugosely punctate, smoother at apex. Ventral surface sparsely punctate and villose. Mesosternum

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not prominent. Legs entirely black; anterior tibiæ bidentate; anterior tarsi with the exterior claw incrassate, bifid at tip; middle claws entire.

Types.—No. 25, U.S.N.M. Three examples, Tana River. Length, 14 mm.

ANOMALA CHANLERI, new species.

Oblong, subparallel, testaceous, shining, glabrous above. Head reddish brown, transverse, rugosely punctured; vertex paler, nearly smooth; clypeus rounded, margin strongly elevated, entire; antennæ testaceous, club somewhat shorter than the stem. Thorax reddish brown, twice broader than long, continuously margined, obsoletely canaliculate at middle, subopaque, very densely and finely, rugosely reticulate; a large round deeply impressed fovea each side; sides rounded, convergent from middle to apex, anterior angles acute, posterior angles obtuse; base very slightly and broadly lobed at middle. Scutellum semioval, finely rugose, margined with brown. Elytra somewhat widened behind the middle, regularly and strongly punctatostriate; intervals subequal, smooth; a strong semicircular impression behind the scutellum. Pygidium vaguely, transversely rugose, fimbriate at apex. Ventral surface sparsely punctate and pilose. Mesosternum not prominent. Anterior tibiæ bidentate. Tarsi infuscate; exterior claws of the anterior and middle legs cleft.

Type.—No. 26, U.S.N.M. One example, Tana River. Length, 12 mm.

ADORETUS PARALLELUS, new species.

Elongate, parallel, testaceous, feebly shining, sparsely griseo-pilose. Head broad, rufo-piceous, densely rugose, vertex smooth at middle. Clypeus with margin black, reflexed, broadly emarginate at middle. Frontal carina distinct, slightly arcuate. Labrum strongly pectinate with a median carina. Antennal club somewhat longer than the stem. Thorax more than twice broader than long, moderately densely punctate, distinctly bisinuate at apex, obsoletely at base; sides arcuate, posterior angles rounded, anterior angles acute. Scutellum ogival, punctulate, smooth at tip. Elytra slightly dilated at middle, obsoletely costate, densely, nearly regularly, striatopunctate; suture and apex narrowly infuscate. Pygidium convex, finely rugosely punctate. Metasternum and abdomen nearly smooth at middle, sparsely punctate at sides. Anterior tibiæ tridentate. Tarsi infuscate, exterior claws of the anterior and middle legs cleft.

Types.—No. 27, U.S.N.M. Two examples, Tana River. Length, 12 mm.

PARAPHOSPHORUS, new genus.

(Group *Tragocephalides*, Lacordaire.)

Antennæ setaceous, twelve-jointed. Thorax with a stout lateral spine at middle, broadly lobed at base. Prosternum declivous before and behind. Mesosternum protuberant in front.

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PARAPHOSPHORUS HOLOLEUCUS, new species.

Elongate, parallel, shining black, nearly impunctate, densely covered with ocherous and whitish pubescence, nearly white above. Antennæ nearly one-half longer than the body, finely pubescent; terminal joint nearly twice as long as eleventh and curved at apex. Front with a longitudinal carina and a deeply impressed arcuate groove between the eyes. Prothorax transverse, apical constrictions slight, interrupted at middle; basal constriction broad and deep; a broad dorsal vitta and the cylindrical lateral spines glabrous. Elytra parallel, broadly conjointly rounded and deplanate at apex; an elevated sutural costa beginning somewhat before middle and nearly reaching the apex; a second costa parallel with the first, but only half its length, abbreviated at each end, glabrous, as are also the humeral umbones, the scutellum, a small round spot on disk before middle and two longitudinal marginal spots behind middle. Ventral surface has the median line and a series of round spots on each side of the abdominal segments glabrous.

Type.—No. 28, U.S.N.M. One example, Tana River. Length, 28 mm.

This form has the appearance of a large species of the group Prosopoceridæ, but the complete absence of cicatrix on the antennal scape and the transverse rather finely granulate inferior lobes of the eyes exclude it from that group.

PROSOPOCERA HOEHNELI, new species.

Elongate, parallel, dark-brown; head, thorax, and ventral surface clothed with an appressed, silky, grayish ferruginous pubescence. Antennæ one-half longer than body; third and fourth joints strongly incrassate, clothed with a short, fine, whitish pubescence that does not conceal the reddish-brown ground color; joints fifth to eleventh annulate with brownish black at the apex; twelfth joint dark at base, attenuate and curved at tip. Frontal horn long, porrect, flat above, strongly furcate at apex. A strongly arcuate, black, glabrous impression between the antennal tubercles, connected with a glabrous line running from top of vertex down to the frontal horn. Thorax strongly transverse, with two constrictions at apex and two at base, the anterior basal constriction deepest; the middle ring convex, uneven, with compressed, very obtuse lateral tubercles, connected across the disk by a partially glabrous impression. Behind this line on the disk each side is a group of glabrous granules; other similar granules behind the lateral tubercles, and on the sides of the front. Elytra broadest between the prominent humeri, slightly narrowed toward the apex, sparsely punctate, rugose behind the humeral umbones; pubescence brown, mottled with white, and with three round ocherous spots each side—one behind the humerus, touching the lateral margin; the second on the disk, near suture, just before middle; and the third one on

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disk, behind middle, approximate to lateral margin; the two anterior pairs of spots with a brown ocellus. Legs brown, with dense, silky pubescence, grayish, becoming ochreous yellow on the inside of tibiæ and beneath the tarsi.

Type.—No. 29, U.S.N.M. One example, Tana River. Length, 23 mm.

ALPHITOPOLA CHANLERI, new species.

Elongate, parallel, nearly impunctate (except on the elytra), reddish brown, sparsely clothed with a fine gray pubescence, varied with large spots of longer, appressed, very dense, ochreous-white hairs. Antennæ one-half longer than body, slender, immaculate; scape as long as fourth joint, stout, gradually and slightly clavate, third joint one-third longer than fourth. Head as broad as thorax, mostly white; an impressed line on the vertex, a deeply impressed arc between the antennal tubercles and a fine carina along the front, glabrous; a vertical line of glabrous granules on each side of the front; brown spots on vertex and genæ. Prothorax cylindrical, as long as broad, constricted about equally deeply at base and apex, with small granuliform lateral tubercles at middle; sides broadly white, the tubercle and a round spot below, brown; a broad white dorsal vitta, abbreviated and triangular in front, including a brown median stripe behind the middle. Elytra much broader than thorax, truncate at base, somewhat constricted at sides behind the prominent humeri, slightly narrowed toward apex; the scutellum, an oblong sutural spot behind it, a small median basal spot, a larger spot in front of and below the humerus, and a broad vitta from the humeral umbone to apex of elytron, white. This vitta is oblique in front, includes a round brown spot before middle, and is nearly interrupted behind the middle by another round spot connected with the brown side margin; the punctuation only visible on the brown parts, deep and coarse at the base, asperately rugose at the umbones, gradually finer posteriorly and obsolete at apex. Ventral surface brown along the middle, sides of thorax and a series of large spots each side of abdomen, white. Mesosternum convex, vertical in front. Intermediate femora with a densely pubescent spot at middle and intermediate tibiæ obliquely sinuate and ciliate before apex, the posterior tibiæ ciliate but not sinuate.

Type.—No. 30, U.S.N.M. One example, Tana River. Length, 17 mm.

MELIXANTHUS IMMACULATUS, new species.

Oval, above fulvous, glabrous, polished. Antennæ reaching somewhat beyond the posterior angles of thorax, the five basal joints fulvous; first joint inflated, longer than second and third together; second globosely oval; third, fourth, and fifth clavate, increasing in length; sixth to eleventh deep black, sparsely tomentose, forming a distinct serrate club. Head, black; eyes, deeply emarginate; front yellow, canaliculate at middle, with a few punctures; clypeus separated by a shallow im-

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pression between the antennæ and two oblique ridges, broadly emarginate at apex. Thorax strongly convex, impunctate, apical and basal margin black; scutellar foveæ nearly obsolete; basal lobe short, truncate; margin serrate at the sides of the base; posterior angles acute. Scutellum much inclined, black, incised in front. Elytra convex, slightly gibbous at apex of scutellum, with regular rows of punctures, confused at apex; base, suture, and apical half of side, margined with black; humeral callus not prominent; epipleural lobe broadly rounded. Pygidium and ventral surface black, feebly shining, punctate, sparsely hairy. Prosternum concave, broadly emarginate at apex; oral lobe very large, vertical, semicircular at apex; mesosternum transverse, flat; metasternum at apex and last ventral segment largely excavate (female). Legs sparsely pilose, fulvous; tarsi black.

Type.—No. 31, U.S.N.M. One example, Jombene Range. Length, 5.5 mm.

PSEUDOMACETES, new genus.

(Group *Pseudocolaspites*, Chapuis.)

Head rounded; epistoma and labrum emarginate; eyes rounded, entire, partly covered by the produced anterior angles of prothorax; antennæ as long as half the body, first joint oblong, inflated, second obconical, shorter than third, third to sixth elongate, compressed, nearly glabrous, very finely punctate, seventh to eleventh incrassate, longer than broad, pubescent and coarsely punctate. Prothorax much narrower than elytra, sides acutely margined, strongly convergent from the base. Scutellum pentagonal. Elytra irregularly punctate with prominent humeral umbone. Prosternum large, transverse, flat. Femora edentate, incrassate at middle, the anterior and posterior pair distinctly larger than the middle pair. Tibiæ without emargination, gradually enlarged toward apex, deeply striate; tarsi not broader than apex of tibiæ, joints one and two subequal, claws cleft.

PSEUDOMACETES ÆNEUS, new species.

Dark æneocupreous, including antennæ and legs, sparsely covered with a fine white appressed pubescence. Head and thorax finely punctate. Elytra gradually narrowed from the humeri, conjointly rounded at apex, coarsely punctate, subseriately on the posterior third.

Types.—No. 32, U.S.N.M. Two examples, Tana River. Length, 6 to 8 mm.

CHRYSOMELA SCUTELLARIS, new species.

Ovate, moderately convex, above coarsely punctate and very finely reticulate, feebly shining. Head red, with a dark cloud on vertex; mouth parts black; antennæ black, gradually and strongly clavate. Thorax regularly convex, much narrower than elytra, black with sides red, more broadly in front; base strongly rounded; apex squarely truncate; lateral impressions almost entirely effaced, indicated only by

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a denser punctuation. Scutellum red, sparsely punctulate, large, nearly twice broader than long. Elytra black, with red margin, punctures with serial arrangement only posteriorly near the suture; a rugose impression at base between the humeral umbone and scutellum. Ventral surface red, propectus and episterna of metathorax blackish; legs black.

Type.—No. 33, U.S.N.M. One example, Jombene Range. Length, 8 mm.

ASPIDOMORPHA MACULICOLLIS, new species.

Nearly circular, moderately convex, shining, pale testaceous above. Antennæ ferruginous, with the last four joints black. Legs ferruginous, anterior femora with a black spot at base. Head black, with a yellow frontal spot. Thorax beneath black, with a testaceous spot at tip of prosternum and a transverse band of same color on the metasternum and its epimera. Abdominal segments testaceous, with black apical margins and brownish clouds toward the sides. Thorax slightly produced anteriorly at middle, impunctate, with four black spots, one semicircular on the disk above the head, one transverse spot at the scutellum, and a narrow transverse stripe each side of the base. Elytra irregularly moderately punctate on the disk, hardly gibbous, deeply impressed each side of scutellum. Lateral margin very wide, obsoletely reticulate, edge narrowly reflexed. A narrow stripe from the umbone to the anterior angle and the suture toward apex, black.

Type.—No. 34, U.S.N.M. One example, Jombene Range. Length, 15 mm.

LACCOPTERA FERRUGINEA, new species.

Slightly oval, pale ferruginous, subopaque. Last antennal joint black. Thorax obsoletely produced at apex, finely rugose; explanate margin rugosely reticulate, finely bordered. Elytra coarsely and densely, rugosely punctate, moderately convex, slightly impressed at the scutellum and behind the humeri; umbones nearly obsolete. Ventral surface more shining, impunctate. Legs annulate with reddish ferruginous, claws brown.

Type.—No. 35, U.S.N.M. One example, Jombene Range. Length, 7 mm.

EPISTICTIA QUADRIPUNCTATA, new species.

Elongate, oval, somewhat shining, finely pubescent, testaceous. Antennæ, mandibles, trochanters, knees, and tarsi shining black. Head largely exposed, subopaque, channeled, rugosely punctate, with two black spots on the vertex. Thorax twice broader than long, apex at middle and base at sides nearly straight; sides broadly deplanate, convergent from base and slightly rounded, very finely margined; anterior angles prominent, obtuse at tip; posterior angles acutely rectangular; basal lobe about one-fourth of width of base, broadly rounded,

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disk sparsely pubescent, densely and finely, rugosely punctate, with four black shining spots, one each side of basal lobe and two in front of these on the middle of the disk; a transverse impression between the posterior pair. Elytra slightly broader than thorax at base, subparallel, conjointly rounded at apex, moderately convex, densely and deeply, somewhat rugosely, punctate, each puncture bearing a scale-like hair; humeral angles acute but hardly prominent; umbones distinct. Ventral surface glabrous, shining.

Type.—No. 36, U.S.N.M. One example, Jombene Range. Length, 9 mm.

DEROSPHÆRUS CARBONATUS, new species.

Elongate, convex, entirely deep black, feebly shining, winged. Antennæ shorter than head and thorax, strongly clavate, third joint one-half longer than fourth, fourth and fifth subequal, a little longer than wide, constricted at base, sixth wider, as broad as long; seventh to tenth still wider, transverse, eleventh longer, rounded at apex; sixth to eleventh forming a compressed, subserrate club. Head exserted, vertical, densely, rugosely punctate; labrum short, rufociliate; clypeus expanded in front, truncate, separated from the front by a deep arcuate groove; canthus very wide; eyes narrow, reniform; ocular sulci very deep, bordering the eye in front and above and divergent posteriorly on the sides of vertex. Thorax convex, densely, rugosely punctate, a little broader at base than at apex; sides rounded, finely margined; base strongly margined, bisinuate. Scutellum semioval, nearly smooth. Elytra parallel, deeply punctatostriate; intervals slightly convex, finely reticulate, obsoletely punctulate. Ventral surface sparsely punctate. Prosternum broad, concave. Legs densely punctate, femora strongly clavate, tarsi narrow, clothed beneath with coarse yellow hairs.

Type.—No. 37, U.S.N.M. One example, Tana River. Length, 11 mm.

ACHROSTUS CYLINDRICORNIS, new species.

Elongate, parallel, ferruginous, shining. Antennæ long, reaching beyond humeri, cylindrical; third joint slightly longer than the following, fourth to seventh a little longer than broad, constricted at base, eighth to eleventh cylindrical, opaque, eighth to tenth subequal, one-half longer than broad, eleventh as long as ninth and tenth united, obliquely obtuse at apex. Labrum short, rounded, infuscate at apex. Clypeus very large, convex, rounded at sides, broadly emarginate at apex, densely punctate, separated from the front by a shallow depression. Front a little broader than diameter of eye seen from above, densely punctate; ocular sulci short. Thorax hardly broader than long, apex broadly lobed at middle; sides parallel, slightly angulate at middle, anterior angles rounded, posterior angles rectangular; base slightly bisinuate, finely margined; disk slightly convex, infuscate, densely and rather strongly punctate, with four shallow foveæ. Scutellum broad

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sparsely punctulate, rounded at apex. Elytra slightly infuscate, with suture and margins ferruginous, crenately punctatostriate; intervals convex, punctulate. Thorax beneath rugosely punctate, opaque. Metasternum and abdomen densely and finely punctate, shining. Legs slender, punctate, entirely ferruginous; tibiæ straight.

Type.—No. 38, U.S.N.M. One example, Jombene Range. Length, 12 mm.

DICHOTYMUS MINOR, new species.

Elongate ovate, piceous, somewhat shining. Antennæ slender, as long as half the body, subserrate, slightly clavate. Clypeus short, densely punctate, truncate at apex, separated from front by a deep groove. Front nearly as broad as diameter of eye seen from above, more strongly punctate. Thorax much narrower than elytra, one-half broader than long, sparsely and finely punctate; sides arcuately convergent from the base, anterior angles rectangular, posterior angles obtuse. Scutellum elongate, triangular, with a few distinct punctures. Elytra rounded at the humeri, conjointly subacuminate at apex, each with eight regular striæ of fine punctures; intervals entirely flat, smooth. Meso- and meta-sternum coarsely punctate at sides. Abdomen finely punctate, first and second segments densely striate at base. Legs long, slender, sparsely punctate; femora fusiform; tibiæ straight, golden pubescent beneath toward apex; tarsi narrow, densely golden pubescent beneath.

Types.—No. 39, U.S.N.M. Five examples, Tana River. Length, 9 to 13 mm.

MERACANTHOIDES, new genus.

(Tribe *Amarygmides*, Lacordaire.)

Eyes large, partly covered by prothorax. Front as broad as diameter of eye seen from above. Antennæ slender, nearly filiform, reaching the elytra. Prosternum declivous posteriorly. Mesosternum a little longer than broad, longitudinally convex at middle, canaliculate each side, slightly furcate at apex. Intercoxal process narrow.

MERACANTHOIDES CUPREOLINEATUS, new species.

Globosely oval. Antennæ ferruginous, third joint longer than fourth, the last joints compressed but hardly perceptibly dilated. Last joint of palpi very broad. Clypeus separated by an arcuate impression, finely reticulate and strongly punctate, shining. Head and thorax dark brown, with metallic lustre, finely and rather densely punctate, subopaque from an extremely fine reticulation. Thorax strongly convex, more than twice broader than long, continuously margined; base lobed at middle; sides arcuate and strongly convergent from the base, angles prominent. Scutellum small, triangular, with a few fine punctures. Elytra with rounded humeri, conjointly subacute at apex, each with eight punctured linear striæ, sharply impressed, much deeper toward

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apex; intervals smooth, flat on disk but strongly convex and alternating in width toward apex. Striæ lined with aureo-cupreous, each interval with a dark violaceous cupreous band, margined with purple. Epipleura and ventral surface dark brown, the former opaque, nearly smooth; metasternum shining at middle, smooth; episterna and abdomen rather densely punctate, opaque. Legs dark brown, strongly punctate; femora subclavate; tarsi narrow, densely flavopilose beneath.

Types.—No. 40, U.S.N.M. Three examples, Jombene Range. Length, 7.5 to 9 mm.

STRONGYLIUM MIRABILE, new species.

Elongate, parallel, bright greenish blue, more shining beneath, with sanguineous elytra. Antennæ hardly reaching posterior angles of thorax, second joint small, round, third obconical, a little longer than fourth, which is twice as broad and forms, with joints five to eleven, a serrate club. Head much exserted, strongly but not very densely punctate, clypeal impression deep and broad; front very broad between the eyes, obsoletely impressed at middle. Thorax convex, continuously margined, as long as broad, strongly punctate, more sparsely at the middle; sides broadly rounded; anterior angles rounded; posterior angles rectangular; basal margin strongly reflexed, bisinuate; two deep punctures on the disk behind the middle. Scutellum semioval, smooth, green. Elytra parallel, striæ more impressed toward apex, densely and deeply punctate; intervals slightly convex, densely punctate. Ventral surface and legs coarsely punctate, middle of metasternum and abdomen nearly smooth.

Type.—No. 41, U.S.N.M. One example, Tana River. Length, 11 mm.

PRAOGENA TIBIALIS, new species.

Elongate, black, shining. Antennæ filiform, longer than half the body. Head flat, very sparsely and finely punctate; clypeus slightly transverse, truncate at apical margin, separated from the front by a fine impressed straight line; front between the eyes as broad as the diameter of eye seen from above; ocular sulci deep, arcuate, reaching from posterior margin of the eyes to the canthus, passing the clypeal suture. Thorax slightly broader than long, broadest at middle, very finely and sparsely punctulate; sides strongly rounded, especially in front; anterior angles entirely wanting; posterior angles obtuse; base feebly bisinuate, strongly margined, with a small, round fovea each side and a shallow depression in front of scutellum. Elytra cupreous, margined with green, much broader than thorax, parallel for three-fourths of the length, deeply striate; striæ crenately punctate; intervals convex, more strongly toward apex, obsoletely punctulate. Ventral surface nearly smooth. Prosternum posteriorly somewhat protuberant and arcuate. Femora black, sparsely punctate; tibiæ sanguineous; tarsi fuscous, with golden pubescence.

Type.—No. 42, U.S.N.M. One example, Jombene Range. Length, 15 mm.

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PRAOGENA SUBVIRIDIS, new species.

Elongate oval, reddish brown, very shining. Antennæ somewhat longer than half the body, filiform, opaque toward apex. Head flat, finely punctate; clypeus transverse, truncate at apex, separated from the front by a finely impressed straight line; front between the eyes broader than diameter of eye seen from above; ocular sulci parallel, narrow, deep, reaching from middle of eye to the clypeal suture. Thorax one-half broader than long, shining black, evenly convex, finely and sparsely punctate; apex truncate; sides broadly rounded; anterior angles strongly rounded; posterior angles obtusely rectangular; base slightly bisinuate, finely margined with a small round fovea each side. Elytra much broader than thorax, greenish brown, strongly convex, subparallel for three-fourths of the length, strongly punctato-striate; intervals slightly convex at base, more so toward the apex, obsoletely punctulate. Ventral surface nearly smooth. Prosternum arcuate, conically produced posteriorly. Legs sparsely punctate, uniform in color.

Type.—No. 43, U.S.N.M. One example, Tana River. Length, 15 mm.

MYLABRIS ATRICORNIS, new species.

Antennæ entirely black. Elytra with basal half yellow; a narrow basal margin, a triangular spot including the scutellum, a round spot behind the humeral umbone and a smaller one between this spot and the suture, black; apical half black, with a tranverse band at apical third, composed of two confluent spots, and a small transverse apical spot, yellow. Otherwise as in *Mylabris flavicornis* Fabricius.

Type.—No. 44, U.S.N.M. One example, Tana River. Length, 18 mm.

MYLABRIS UNICINCTA, new species.

Elongate, deep black; antennæ yellow, with first joint black and second brown; elytra black, with a sharply limited elevated yellow median band of uniform width (2.2 mm.) from margin to margin. Otherwise as in *Mylabris flavicornis* of Fabricius.

Type.—No. 45, U.S.N.M. One example, Tana River. Length, 23 mm.

THYLACITES TANA, new species.

Elongate, mottled with grayish white and brownish rounded scales sparsely mixed with short gray hairs. Antennæ short, sparsely covered with long grayish hairs, second and third joint equal, shortly obconical, only slightly longer than the following, seventh joint subcontiguous to the club, which is oval, acuminate, densely clothed with short whitish, appressed pubescence. Eyes round, very prominent. A deep frontal sulcus reaching from vertex to middle of rostrum, which is attenuate toward apex, flat above, carinate at sides. A short deep sulcus outside the carina, in front of and above the eyes. Antennal grooves very deep, narrow at tip, strongly arcuate and widened toward

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the inferior margin of head, far below the eyes. Thorax trivittate, a little longer than broad, cylindrical, broadly constricted at each end; disk coarsely, transversely callose. Scutellum small, triangular, with dense white scales. Elytra nearly fusiform, without humeri, with a scutellar spot and an indefinite lateral vitta white; basal margin thickened and reflexed; disk with ten rows of deep round punctures, the ninth and tenth striæ deeply impressed. Legs slender, sparsely pilose, the anterior tibiæ longer, serrately toothed beneath, curved and mucronate at apex; posterior tibiæ unarmed, with open corbels, the last tarsal joint slightly broader than the others; claws connate at base.

Type.—No. 46, U.S.N.M. One example, Tana River. Length, 14 mm.

TANYMECUS AUREOSQUAMOSUS, new species.

Elongate, piceous, densely covered with small rounded aureous and piceous scales, irregularly maculate; antennæ, apex of rostrum, ventral surface, and legs sparsely hairy. Rostrum distinctly carinate at middle, second joint of funicle one-half longer than the first. Thorax somewhat rounded on the sides. Other structural characters and form as in *Tanymecus palliatus* Fabricius.

Types.—No. 47, U.S.N.M. Two examples, Tana River. Length, 13 mm.

CYPHOIDES, new genus.

(Group *Cyphides*, Lacordaire.)

Head very short, flat above, constricted immediately behind the round, prominent eyes. Rostrum more than twice longer than head, parallel, flattened above, angular at sides, acutely incised at apex. Antennæ hardly reaching the base of thorax; scape long, reaching the thorax, straight, clavate at apex; funicle seven-jointed, the first two joints longer, the second longer than the first; club ovate, annulate, densely pubescent. Thorax strongly narrowed in front, base deeply bisinuate. Scutellum small, oval. Elytra much broader than thorax, separately prominent at base, convex, strongly declivous behind; humeri distinct, obliquely truncate; striæ ten, entire. Legs normal in length, femora fusiform, unarmed, tibiæ expanded and mucronate at apex, corbels of posterior tibiæ large, closed, scaly. Third tarsal joint very broad, bilobed. Claws connate.

Type.—*Cyphoides impressifrons*, new species.

CYPHOIDES IMPRESSIFRONS, new species.

Ovate, covered with a crust composed of small rounded metallic scales, dark cupreous above, with three fasciate spots on the sides of elytra yellowish white; ventral surface whitish. Rostrum above obsoletely bicarinate, separated from the front by a deep angular impression, connected with a still deeper short frontal fovea. Thorax

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strongly rounded at sides, constricted in front; base nearly twice broader than apex. Elytral striæ not impressed, of deep oblong closely approximate punctures. Femora slightly incrassate. Tibiæ denticulate and fimbriate within.

Type.—No. 48, U.S.N.M. One example, Tana River. Length, 8 mm.

CYPHOIDES FOVEICOLLIS, new species.

Ovate, ferruginous, densely covered with small rounded metallic scales, mostly greenish white, disk of thorax and two angular transverse fasciæ on elytra infuscate. Rostrum separated from front by an angular impressed stria; a fine sulcus from vertex to apex of rostrum. Thorax conical, slightly constricted in front, base twice broader than apex, disk with a round impressed fovea each side of middle. Elytral striæ distinctly impressed, deeply and densely punctate; intervals slightly convex. Femora slender. Tibiæ hairy, not denticulate. Last ventral segment of male obtuse, with curvilinear sides, of female more acute, with sides rectilinear.

Types.—No. 49, U.S.N.M. Fourteen examples, Tana River. Length, 5 to 7.5 mm.

LIST OF SPECIES COLLECTED.

Family CICINDELIDÆ.

1. MEGACEPHALA REGALIS, Boheman.

One pair, male and female, Tana River.

2. CICINDELA REGALIS, Dejean.

Five examples, Jombene Range.

3. CICINDELA CLATHRATA, Dejean.

Cicindela intermedia, KLUG, Monatsb. Akad. Wiss Berl., 1853, p. 245; Peters' Reise n. Mozamb., Zool., V, p. 146 (1862).

One example, Jombene Range.

Family CARABIDÆ.

4. CALOSOMA PROCERUM, Harold.

Two examples, Jombene Range.

5. CRASPEDOPHORUS EUSTALACTUS, Gerstaecker.

Four examples, Jombene Range.

6. TEFFLUS VIOLACEUS, Klug.

One example, Tana River.

7. TEFFLUS JUVENILIS, Gerstaecker.

One example, Jombene Range.

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8. POLYHIRMA POLIOLOMA, Chaudoir.

One examhle, Tana River.

9. POLYHIRMA QUADRIPLAGIATA, Gerstaecker.

Two examples, Tana River.

10. POLYHIRMA CHANLERI, Linell.

Three examples, Tana River.

11. ANTHIA CAVERNOSA, Gerstaecker.

Five examples, Tana River; one Jombene Range.

12. MACROCHILUS LUGUBRIS, Schaum.

One example, Jombene Range.

13. CHLÆNIUS DISCOPICTUS, Fairmaire.

One example, Tana River.

14. OODES NIGRITA, Chaudoir.

Oodes lucidus, GERSTAECKER, Archiv. für Nat., XXXIV, 1, p. 21, (1867);—Von der Decken's Reisen in Ost Africa, III, 2, p. 70 (1873).

Three examples, Tana River.

15. ANGYONYCHUS LIVIDUS, Klug.

One example, Tana River.

Family GYRINIDÆ.

16. DINEUTES SUBSPINOSUS, Klug.

One example, Tana River.

Family DYTISCIDÆ.

17. CYBISTER IMMARGINATUS, Fabricius.

One example, Tana River.

18. CYBISTER TRIPUNCTATUS, Olivier.

Two examples, Tana River.

19. CYBISTER BINOTATUS, Klug.

One example, Tana River.

Family HYDROPHILIDÆ.

20. HYDROCHARES RUFIFEMORATUS, Hope.

Five examples, Tana River.

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Family SILPHIDÆ.

21. SILPHA MICANS, Fabricius.

Three examples, Jombene Range.

Family PAUSSIDÆ.

22. PAUSSUS PROCERUS, Gerstaecker.

One example, Tana River.

Family STAPHYLINIDÆ.

23. TÆNODEMA AFRICANUM, Gestro.

One example, Tana River.

Family COCCINELLIDÆ.

24. EPILACHNA CHRYSOMELINA, Gerstaecker.

One example, Tana River.

25. EPILACHNA PUNCTIPENNIS, Mulsant.

One example, Tana River.

Family HISTERIDÆ.

26. HISTER ROBUSTUS, Erichson.

One example, Jombene Range.

27. SAPRINUS SPLENDENS, Paykull.

Nineteen examples, Tana River.

Family TROGOSITIDÆ.

28. TENEBRIOIDES MAURITANICA, Linnæus.

One example, Tana River.

Family BUPRESTIDÆ.

29. TERNOCERA REVOILI, Fairmaire.

One example, Jombene Range.

30. STERNOCERA HUNTERI, Waterhouse.

Two examples, Tana River.

31. STERNOCERA BOUCARDI, Saunders.

Four examples, Jombene Range.

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32. STERNOCERA HILDEBRANDTI, Harold.

Three examples, Jombene Range.

33. JULODIS HOEHNELII, Fairmaire.

One example, Tana River.

34. CHRYSOBOTHRYS DORSATA, Fabricius.

Four specimens, Tana River.

35. CHALCOPHORA PUBIVENTRIS, Castelneau and Gory.

One example, Jombene Range.

36. PSILOPTERA AMAUROTICA, Klug.

Two examples, Jombene Range.

37. PSILOPTERA PYRITOSA, Klug.

One example, Tana River.

38. ACMÆODERA GRANDIS, Guérin de Méneville.

Two examples, Jombene Range.

39. SPHENOPTERA TRISPINOSA, Klug.

One example, Jombene Range.

Family ELATERIDÆ.

40. AGRYPNUS PARALLELICOLLIS, Candèze.

One example, Jombene Range.

41. PSEPHUS SOMALIUS, Fairmaire.

One example, Tana River.

42. PSEPHUS HOEHNELI, Linell.

Three examples, Tana River.

43. HEMICLEUS ADSPERSULUS, Klug.

Two examples, Tana River.

44. HETERODERES SPISSUS, Candèze.

One example, Tana River.

45. CARDIOPHORUS PATERNUS, Candèze.

One example, Tana River.

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Family LAMPYRIDÆ.

46. LYCUS INTERMEDIUS, Bourgeois.

One example, Jombene Range.

47. LUCIOLA CISTELOIDES, Klug.

One example, Tana River.

Family MALACHIIDÆ.

48. PRIONOCERUS DIMIDIATUS, Gerstaecker.

One example, Tana River.

Family CLERIDÆ.

49. CYMATODERA CINGULATA, Klug.

One example, Tana River.

50. PHLŒOCOPUS VINCTUS, Gerstaecker.

One example, Tana River.

51. PLACOCERUS FULVUS, Linell.

One example, Jombene Range.

Family PTINIDÆ.

52. PTILINUS DENTICORNIS, Castelneau.

One example, Tana River.

53. BOSTRICHUS CORNUTUS, Olivier.

Two examples, Tana River.

54. XYLOPERTHA PICEA, Olivier.

One example, Tana River.

55. XYLOPERTHA CASTANEIPENNIS, Faohraeus.

Two examples, Tana River.

Family LYMEXYLONIDÆ.

56. ATRACTOCERUS BREVICORNIS, Linnæus.

One example, Jombene Range.

Family SCARABÆIDÆ.

57. ATEUCHUS THOMSONI, Waterhouse.

Ten examples, Tana River.

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58. GYMNOPLEURUS THALASSINUS, Klug.

Two examples, Tana River.

59. GYMNOPLEURUS VIRENS, Erichson.

Two examples, Tana River.

60. STIPTOPODIUS DORIÆ, Harold.

One example, Tana River.

61. CATHARSIUS PANDION, Harold.

One example, Tana River.

62. ONTHOPHAGUS NIGRICORNIS, Fairmaire.

One example, Jombene Range.

63. ONTHOPHAGUS TUBERCULIFRONS, Castelneau.

Two examples, Jombene Range.[1]

64. ONTHOPHAGUS GERSTAECKERI, Harold.

One example, Tana River.

65. ONTHOPHAGUS OVULUM, Gerstaecker.

One example, Tana River.

66. PHALOPS BECCARII, Harold.

One example, Jombene Range.

67. APHODIUS PALLESCENS, Walker.

One example, Tana River.

68. CHIRON KELLERI, Fairmaire.

One example, Tana River.

69. ORPHNUS THORACICUS, Linell.

One male, Tana River.

70. ORPHNUS, dubious species.[2]

One female, Tana River.

[1] Both males; one of them corresponds with Castelneau's description, the other one differs in having anterior half of thorax broadly and deeply excavate at middle, and all four thoracic horns of equal size and form, exactly like the lateral horns of the typical form. In the absence of any other marked difference, I take it to be an unusually well developed specimen of the same species.

[2] Species marked "dubious" in this paper are probably undescribed, but the material on hand is insufficient for their proper study.

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71. PHŒOCHROUS BECCARII, Harold.

Fourteen examples, Tana River.

72. HYBOSORUS NITIDUS, Lansberge.

One example, Tana River.

73. TROX SQUALIDUS, Olivier.

One example, Tana River.

74. TROX MELANCHOLICUS, Faohraeus.

One example, Tana River.

75. TROX DENTICULATUS, Olivier.

Eight examples, Tana River.

76. TROX NILOTICUS, Harold.

Four examples, Tana River.

77. TROCHALUS CORINTHIA, Gerstaecker.

Three examples, Tana River.

78. TROCHALUS FALLACIOSUS, Gerstaecker.

One example, Tana River.

79. TROCHALUS SUBROTUNDUS, Linell.

Two examples, Tana River.

80. SERICA CONSIMILIS, Linell.

One example, Tana River.

81. SERICA NITIDIROSTRIS, Linell.

One example, Tana River.

82. PEGYLIS RUFOMACULATUS, Linell.

One example, Tana River.

83. SCHIZONYCHA MINUTA, Raffray.

One example, Tana River.

84. SCHIZONYCHA VALIDA, Boheman.

Two examples, Tana River.

85. SCHIZONYCHA LONGITARSIS, Linell.

Four males and one female, Tana River.

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86. ANOMALA PALLIDA, Fabricius.

Two examples, Tana River.

87. ANOMALA PALLIDULA, Latreille.

One example, Tana River.

88. ANOMALA BOTTÆ, Blanchard.

Three examples, Tana River.

89. ANOMALA CRASSA, Linell.

Three examples, Tana River.

90. ANOMALA CHANLERI, Linell.

One example, Tana River.

91. ADORETUS PICTICOLLIS, Faohraeus.

One example, Tana River.

92. ADORETUS PARALLELUS, Linell.

Two examples, Tana River.

93. ORYCTES SENEGALENSIS, Klug.

Three examples, Tana River.

94. DIPLOGNATHA GAGATES, Fabricius.

One example, Tana River.

Family CERAMBYCIDÆ.

95. MACROTOMA COELASPIS, White.

One male and three females, Tana River.

96. MACROTOMA FULIGINOSA, Faohraeus.

One female, Tana River.

97. XYSTROCERA MARGINALIS, Goldfuss.

One example, Tana River.

98. XYSTROCERA NIGRITA, Servigny.

One example, Tana River.

99. CORDYLOMERA ANNULICORNIS, Fairmaire.

One example, Tana River.

100. COMPSOMERA ELEGANTISSIMA, White.

One example, Tana River.

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101. DIASTOCERA RETICULATA, Thomson.

Two examples, Tana River.

102. PARAPHOSPHORUS HOLOLEUCUS, Linell.

One example, Tana River.

103. CERATITES JASPIDEUS, Servigny.

Six examples, Tana River.

104. PROSOPOCERA HOEHNELI, Linell.

One example, Tana River.

105. ALPHITOPOLA CHANLERI, Linell.

One example, Tana River.

106. COPTOPS BIDENS, Fabricius.

One example, Tana River.

107. APOMECYNA MACULARIA, Harold.

One example, Tana River.

108. NONYMA, dubious species.

One example, Tana River.

109. EUNIDIA, dubious species.

One example, Tana River.

110. VOLUMNIA WESTERMANNI, Thomson.

Two examples, Tana River.

111. NITOCRIS ABDOMINALIS, Faohraeus.

One example, Tana River.

112. OBEREA ZANZIBARICA, Harold.

One example, Tana River.

113. NUPSERHA GLOBICEPS, Harold.

One example, Tana River.

Family CHRYSOMELIDÆ.

114. MELITONOMA SOBRINA, Lacordaire.

Six examples, Jombene Range.

115. MELIXANTHUS IMMACULATUS, Linell.

One example, Jombene Range.

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116. EURYOPE BATESI, Jacoby.

One example, Tana River.

117. COLASPOSOMA GIBBICOLLE, Jacoby.

Three examples, Jombene Range.

118. PSEUDOMACETES ÆNEUS, Linell.

Two examples, Tana River.

119. CHRYSOMELA SANSIBARICA, Harold.

Two examples, Jombene Range.

120. CHRYSOMELA SCUTELLARIS, Linell.

One example, Jombene Range.

121. OIDES TYPOGRAPHICA, Ritsema.

Two examples, Jombene Range.

122. LUPERUS, dubious species.

One example, Tana River.

123. HISPA QUADRIFIDA, Gerstaecker.

One example, Tana River.

124. HISPA ACANTHINA, Reiche.

Six examples, Jombene Range.

125. ASPIDOMORPHA QUADRIMACULATA, Olivier.

Two examples, Jombene Range.

126. ASPIDOMORPHA HYBRIDA, Boheman.

One example, Jombene Range.

127. ASPIDOMORPHA SILACEA, Boheman.

Six examples, Jombene Range.

128. ASPIDOMORPHA MACULICOLLIS, Linell.

One example, Jombene Range.

129. COPTOCYCLA NIGROSEPTA, Fairmaire.

One example, Jombene Range.

130. CASSIDA VIGINTIMACULATA, Thunberg.

Two examples, Jombene Range.

131. LACCOPTERA FERRUGINEA, Linell.

One example, Jombene Range.

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132. EPISTICTIA QUADRIPUNCTATA, Linell.

One example, Jombene Range.

Family TENEBRIONIDÆ.

133. ZOPHOSIS AGABOIDES, Gerstaecker.

One example, Tana River.

134. DIODONTES PORCATUS, Solier.

One example, Tana River.

135. NOTHOCERUS CYLINDRICORNIS, Fairmaire.

One example, Tana River.

136. HOMALA INTEGRICOLLIS, Fairmaire.

One example, Tana River, and one Jombene Range.

137. RHYTIDONOTA GRAVIDULA, Gerstaecker.

Four examples, Tana River.

138. RHYTIDONOTA GRACILIS, Gerstaecker.

One example, Tana River.

HIMATISMUS TESSULATUS, Gerstaecker.

Three examples, Tana River, and one Jombene Range.

140. PIMELIA HILDEBRANDTI, Harold.

Nine examples, Tana River.

141. PHRYNOCOLUS UNDATOCOSTATUS, Kolbe.

Eight examples, Tana River.

142. PHRYNOCOLUS PETROSUS, Gerstaecker.

Eight examples, Tana River.

143. SEPIDIUM FURCIFERUM, Gerstaecker.

One example, Jombene Range.

144. VIETA PROTENSA, Fairmaire.

One example, Tana River.

145. OPATRUM VIRGATUM, Erichson.

One example, Tana River.

146. ALPHITOBIUS PICEUS, Olivier.

One example, Tana River.

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147. ENDOSTOMUS PLICICOLLIS, Fairmaire.

One example, Tana River.

148. DEROSPHÆRUS CARBONATUS, Linell.

One example, Tana River.

149. TOXICUM TAURUS, Fabricius.

One example, Tana River.

150. ACHROSTUS CYLINDRICORNIS, Linell.

One example, Jombene Range.

151. PYCNOCERUS PASSERINII, Bertolini.

One example, Tana River.

152. DICHOTYMUS STRIATIPENNIS, Fairmaire.

One example, Tana River.

153. DICHOTYMUS MINOR, Linell.

Five examples, Tana River.

154. MERACANTHOIDES CUPREOLINEATUS, Linell.

Three examples, Jombene Range.

155. EUPEZUS NATALENSIS, Lacordaire.

One example, Tana River.

156. HOPLONYX AFER, Faohraeus.

One example, Jombene Range.

157. HOPLONYX IMPUNCTICOLLIS, Fairmaire.

One example, Tana River.

158. STRONGYLIUM MIRABILE, Linell.

One example, Tana River.

159. PRAOGENA VIRIDICUPREA, Gerstaecker.

Two examples, Tana River.

160. PRAOGENA SUBVIRIDIS, Linell.

One example, Tana River.

161. PRAOGENA TIBIALIS, Linell.

One example, Jombene Range.

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Family LAGRIIDÆ.

162. LAGRIA ÆRUGINEA, Gerstaecker.

One example, Tana River.

163. LAGRIA VILLOSA, Fabricius.

Two examples, Tana River.

164. LAGRIA PLEBEJA, Gerstaecker.

Two examples, Tana River.

Family MELOIDÆ.

165. MYLABRIS TRIPARTITA, Gerstaecker.

Two examples, Tana River.

166. MYLABRIS AMPLECTENS, Gerstaecker.

One example, Tana River.

167. MYLABRIS CALLICERA, Gerstaecker.

One example, Tana River.

168. MYLABRIS TRISTIGMA, Gerstaecker.

One example, Tana River.[1]

169. MYLABRIS FLAVICORNIS, Fabricius.

Four examples, Tana River.[2]

170. MYLABRIS LICTOR, Gerstaecker.

One example, Tana River.

1.71 MYLABRIS ATRICORNIS, Linell.

One example, Tana River.

172. MYLABRIS UNICINCTA, Linell.

One example, Tana River.

173. CORYNA AMBIGUA, Gerstaecker.

One example, Tana River.[3]

174. CORYNA KERSTENI, Gerstaecker.

Five examples, Tana River.[4]

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[1] A variety with a round submarginal yellow spot in the black apical field of elytra.

[2] These differ from Caffrarian examples in having two basal joints of antennæ black. *Mylabris tristigma* of Gerstaecker is also, I think, a variety of *flavicornis*, Fabricius.

[3] The specimen approaches *parenthesis* of Gerstaecker in part of coloration.

[4] The series, together with fourteen examples collected by Dr. W. L. Abbott in Masai-land, proves conclusively that these two species of Gerstaecker must be united.

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175. LYTTA VITTIPENNIS, Kolbe.

Two examples, Tana River.

176. LYTTA NYASSENSIS, Haag-Rutenberg.

Two examples, Tana River.

Family OTIORRHYNCHIDÆ.

177. MICROCERUS SPINIGER, Gerstaecker.

One example, Tana River.

178. MICROCERUS SUBCAUDATUS, Gerstaecker.

One example, Tana River.

179. PERIBROTUS PUSTULOSUS, Gerstaecker.

One example, Tana River.

180. SYSTATES SEMINUDUS, Gerstaecker.

One example, Tana River.

181. SYSTATES ÆNEOLUS, Harold.

One example, Tana River.

182. THYLACITES TANA, Linell.

One example, Tana River.

183. TANYMECUS AUREOSQUAMOSUS, Linell.

Four examples, Tana River.

184. TANYMECUS, dubious species.

One example, Tana River.

185. CYPHOIDES IMPRESSIFRONS, Linell.

One example, Tana River.

186. CYPHOIDES FOVEICOLLIS, Linell.

Fourteen examples, Tana River.

Family CURCULIONIDÆ.

187. SPHADASMUS SEMICOSTATUS, Fairmaire.

One example, Tana River.

188. CAMPTORRHINUS HYSTRIX, Fairmaire.

Three examples, Tana River.

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Family BRENTHIDÆ.

189. AMORPHOCEPHALUS IMITATOR, Faohraeus.

One example, Tana River.

190. CYLAS BRUNNEUS, Fabricius.

One example, Tana River.

Family CALANDRIDÆ.

191. RHYNCHOPHORUS PHOENICIS, Fabricius.

One example, Tana River.

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CONTRIBUTIONS TO THE NATURAL HISTORY OF THE COMMANDER ISLANDS.

XI. THE CRANIUM OF PALLAS'S CORMORANT.

By FREDERIC A. LUCAS,
Curator of the Department of Comparative Anatomy.

IN 1882 Dr. Leonhard Stejneger[1] obtained from a natural bone deposit on Bering Island a small number of bones of Pallas's Cormorant, *Phalacrocorax perspicillatus*. During the summer of 1895 Dr. Stejneger again visited Bering Island and obtained from the same deposit a second lot of bones, the most important of which were a cranium and sternum.

The cranium (No. 19417, U.S.N.M.), or, strictly speaking, the calvarium, in its general contour most closely resembles that of *P. penicillatus* among existing cormorants, but is decidedly larger, and is proportionately wider than in that species, while the beak is shorter. As far as mere size is concerned, the skull of an adult male of *P. carbo* would be as long as that of *P. perspicillatus*, but the latter is much wider and is more depressed. The cranium is readily distinguished from that of *P. urile* by its greater size and less depression, and by having a proportionately stouter beak, whose ridge lacks the slight but characteristic emargination found near the base of the beak in *P. urile*.

As a matter of fact, the differentiation of cormorants into species with grooved beaks and those without does not exist, so far as the bony beak is concerned. Some have deeper grooves than others, but all have more or less of a furrow along the side of the mandible, and there is every degree of gradation, from such well-furrowed beaks as those of *P. albiventris* and *P. magellanicus* to the shallow grooves of *P. melanoleucus* and *P. carbo*.

[1] Proc. U. S. Nat. Mus., XVII, 1889, pp. 83–94.

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Pallas's Cormorant shows a marked difference from all others examined in the development of the lateral ethmoid. In other species the lachrymal sends a process inward which fuses with a spur from the mesethmoid to form a more or less L-shaped bar of bone, uniting the frontal and mesethmoid. A small spur, arising from the inferior inner angle thus formed, represents the lateral ethmoid, and this is usually but little developed, being largest in *P. penicillatus* and obsolete in *P. urile*. In *P. perspicillatus* there is a lateral ethmoid plate, complete save for an opening above, being the retention by ossification of a cartilaginous plate found in the nestling of *P. urile* before the nostrils have become closed. The maxillopalatines are also slightly better developed than in any existing cormorant, and while the difference is small, still it does exist, and here again it is seen by comparison to be the development of a character found in young birds.

Differences exist between *P. perspicillatus* and other cormorants by the presence of a narrow bar of bone forming two precranial cavities where but a single opening exists in allied species, and in the comparatively small size and regular lyrate form of these openings. From these conditions it will be seen that there is in the cranium an excess of ossification over that found in other cormorants. While no bar of bone has been found in other species, there are hints of it in some, thus, *P. penicillatus* and *P. magellanicus*, in the shape of a little bony spike running upward from the alisphenoids, and it is not impossible that the complete bar may be found in some very old individual. This is the more probable because in the young, of *P. urile* at least, there is a bar of cartilage occupying the place of the bar of bone found in Pallas's Cormorant.

The sternum (No. 19417, U.S.N.M.) found with the present series of bones is important, as its size indicates it to be that of a male, and shows the sternum previously described to have been that of a female, or possibly even that of a male of *P. urile*. It is very much larger than any sternum of *P. urile*, and much larger even than the large specimen of *P. carbo*, used for comparison.[1] The present sternum is thus in harmony with the other bones, and aids materially in emphasizing the superior size of *P. perspicillatus*.

The appended tables give the measurements of the cranium and sternum here described, compared with the corresponding parts of other species. The measurements of the previously described sternum, ascribed to *P. perspicillatus*, are repeated and an error of the first-given table corrected. The length from anterior end of carina to end of mesoxiphoid is said to be 104 mm., when it should have been 90 mm.

Unfortunately the skull of *P. carbo* now available is smaller than that of the individual used as a term of comparison in the previous paper[2] on Pallas's Cormorant.

[1] Proc. U. S. Nat. Mus., XII, 1889, pp. 88–94.
[2] Loc. cit.

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Measurements[1] *of species of Phalacrocorax.*[2]

STERNUM.

	P. perspicillatus, male (U.S.N.M., No. 19417).	*P. carbo*, male (Yale College, No. 535).	*P. penicillatus* (U.S.N.M., No. 18535).	*P. urile*, male (U.S.N.M., No. 12502).
	mm.	*mm.*	*mm.*	*mm.*
Anterior end of carina to mesoxiphoid	[3] 132	119	101	104
Manubrium to mesoxiphoid	109	97	87	90
Depth of carina	[3] 40	33	22	25
Width across articulations of first rib	84	66	60	70
Width across articulations of fourth rib	72	59	58	65

SKULL.

	P. perspicillatus, male (U.S.N.M., No. 19417).	*P. carbo*, male (U.S.N.M., No. 18851).	*P penicillatus* (U.S.N.M., No. 940).	*P. urile*, male (U.S.N.M., No. 12502).
	mm.	*mm.*	*mm.*	*mm.*
Tip of mandible to occipital condyle	[4] 148	135	141	116
Fronto-nasal hinge to articulation for occipital style	69	61	62	55
Across anterior part of frontals	22	20	19	13
Across postorbital processes	39	31	32	25
Across squamosal processes	45	36	37	32
Across exoccipital processes	40	33	33	26

[1] The measurements are in a straight line.

[2] Proc. U. S. Nat. Mus., XII, 1889, p. 88.

[3] Estimated, owing to breakage.

[4] Taken from rostrum of one bird and calvarium of another.

EXPLANATION OF PLATES.

PLATE XXXIV.

[All figures natural size.]

Fig. 1. *Phalacrocorax perspicillatus*, inferior aspect of cranium. The anterior and posterior portions are from different individuals.

2. *Phalacrocorax perspicillatus*, left ramus of jaw, external aspect

3. *Phalacrocorax perspicillatus*, mandible and left palatine.

PLATE XXXV.

[Two-thirds natural size.]

Fig. 1. *Phalacrocorax penicillatus.*

2. *Phalacrocorax perspicillatus.*

3. *Phalacrocorax carbo.*

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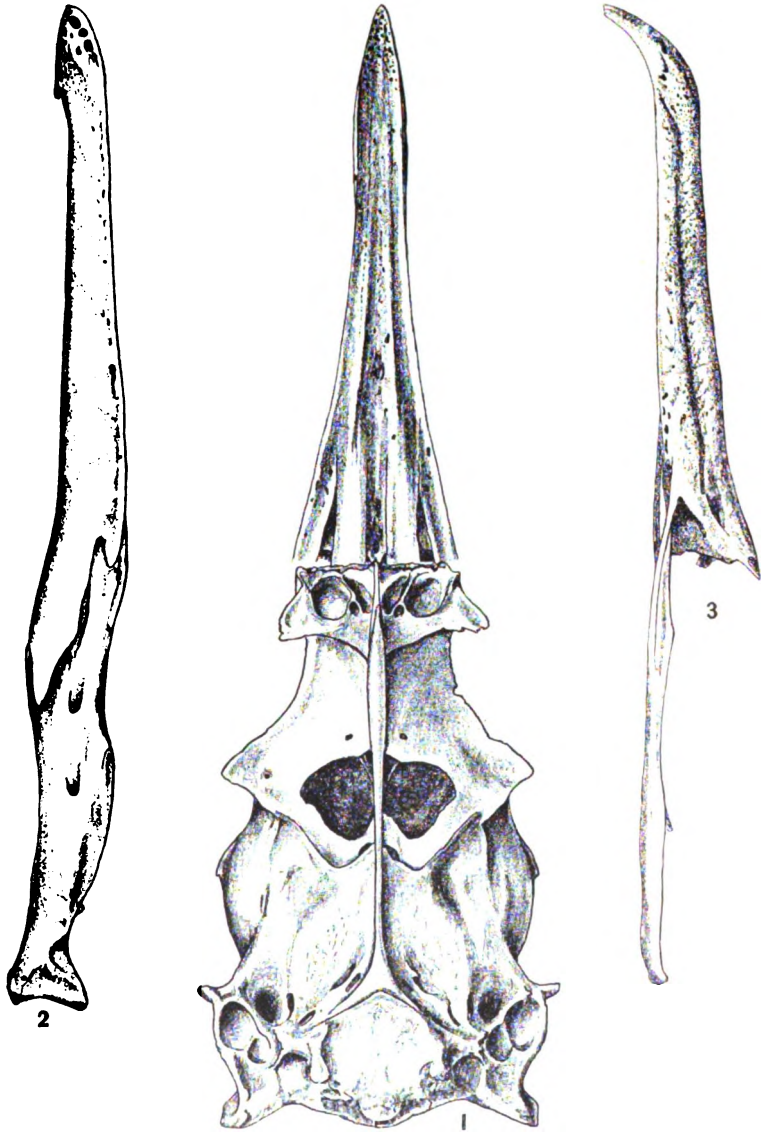

CRANIUM OF PALLAS'S CORMORANT

Phalacrocorax perspicillatus

FOR EXPLANATION OF PLATE SEE PAGE 719

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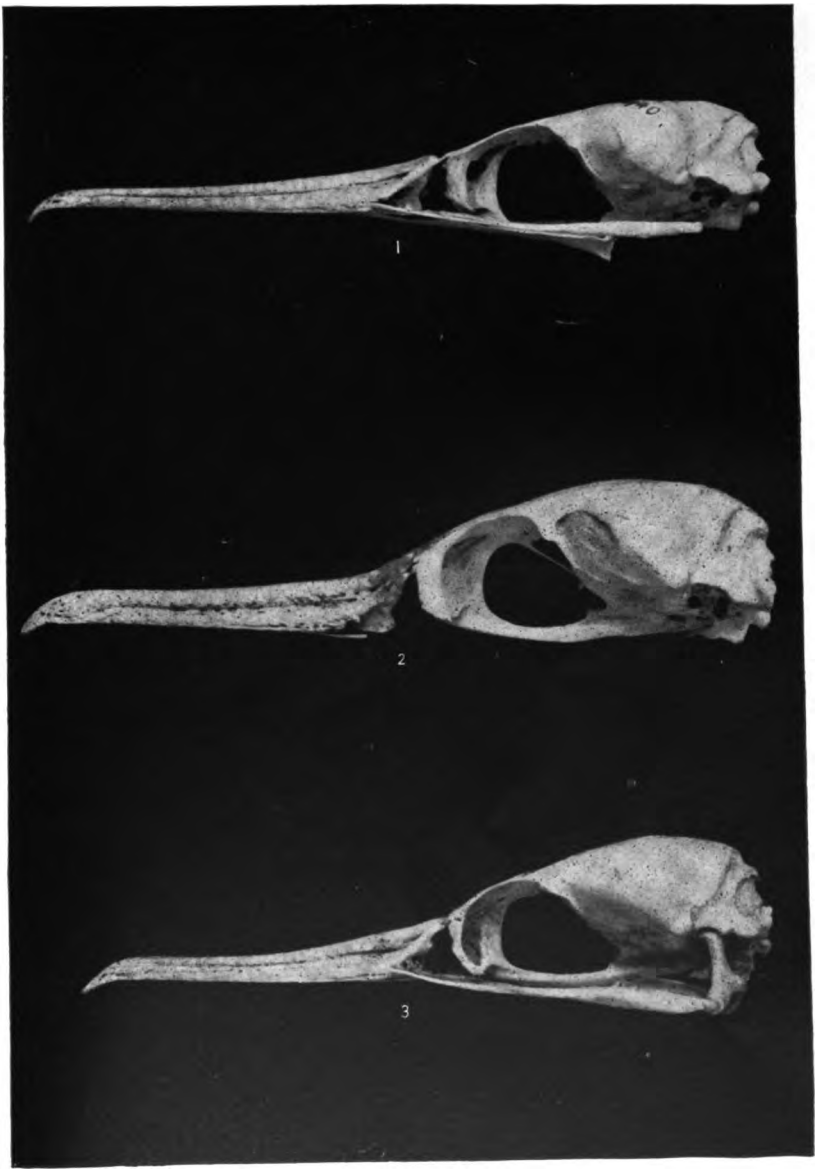

CRANIA OF PALLAS'S CORMORANT

Phalacrocorax perspicillatus and *Phalacrocorax carbo*

FOR EXPLANATION OF PLATE SEE PAGE 719

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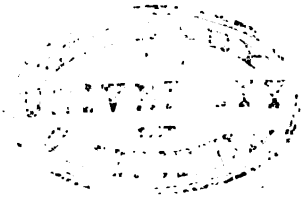

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NEW SPECIES OF NORTH AMERICAN COLEOPTERA OF THE FAMILY SCARABÆIDÆ.

By MARTIN L. LINELL,
Aid, Department of Insects.

IN rearranging the U. S. National Museum collection of North American Coleoptera of the family Scarabæidæ, a certain number of forms were met with among the recent accessions that evidently are undescribed and should be put on record as additions to our fauna. It was found necessary to erect a new genus for some small species occurring in the Southwest. A few notes have also been added on previously described species.

PINOTUS COLONICUS, Say.

A species widely distributed in Mexico, which differs from *P. carolinus*, Linnæus, by male having two tubercles on the front, one above the other, should be added to our Texan fauna. A specimen is in the National Museum collection, taken by Prof. C. H. Tyler Townsend in Brownsville, Texas, September 5, 1895.

PSAMMODIUS SCHWARZI, new species.

Oblong, parallel, convex, shining reddish brown; vertex, disk of thorax, and sometimes sutural region of elytra, piceous. Head moderately coarsely asperate; vertex smooth. Clypeus broadly and deeply emarginate, without teeth; sides broadly rounded; genæ obtuse, slightly prominent. Thorax wider than long, not narrowed in front; sides arcuate, the margin indistinctly crenulate; anterior angles slightly prominent, obtuse; posterior rounded; base slightly arcuate, with very deep marginal line; disk convex, sparsely and finely punctate, with an irregular group of coarse punctures (from 8 to 15) each side, and a small round fovea near the front angles. Elytra as wide at base as the thorax; humeri obtuse; sides nearly parallel; disk deeply striate, striæ distinctly, somewhat crenately punctured; intervals convex, smooth. Mesosternum opaque, densely punctulate, carinate between the coxæ. Metasternum smooth, polished, flattened and longitudinally impressed

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at middle. Abdomen nearly smooth, with a few coarse punctures at the sides, the last segments with strongly crenate basal margin. Femora equally incrassate, smooth. Anterior tibiæ strongly tridentate; posterior moderately stout, expanded at tip, with three rows of small asperate tubercles but no oblique ridges. The posterior tarsi nearly as long as the tibia; the joints decreasing in thickness; the first one hardly wider toward apex, angular but not compressed, slightly arcuate, fully as long as the three following together which are subequal in length, a little longer than thick, constricted at base; last joint as long as third and fourth together.

Length, 3.6 mm. Seven examples from Jacksonville, Florida (collected by Mr. William H. Ashmead), are in the collection of Hubbard and Schwarz, two of which these gentlemen have presented to the National Museum.

Types.—No. 559, U.S.N.M.

This species has more strictly the generic characters of *Pleurophorus* in the hind tarsi, but must be placed near *Psammodius bidens*, Horn, as the nearest ally in our fauna. It has the same shape as this species, but is slightly larger and lighter in color.

APHODIUS COQUILLETTI, new species.

Shining ferruginous, with lateral and basal margin of thorax and elytral suture narrowly black; tibiæ and base of tarsi infuscate. Head convex, finely punctate, without tubercles or clypeal ridge. Clypeus slightly rugose, concave at middle; margin broadly emarginate, with a strong acute tooth each side; sides irregularly arcuate, strongly fimbriate; genæ prominent, subangulate. Thorax with the sides fimbriate, broadly explanate, foveate near the obtuse hind angles; base distinctly margined, arcuate at middle, emarginate each side at the angles; disk convex, finely, not very densely, punctate; explanate sides coarsely, rugosely punctate. Elytra glabrous, fimbriate at margin; humeri obtuse; striæ fine, vaguely punctate; intervals minutely rugose, with coarse, irregularly biseriate punctures. Ventral surface finely pubescent, sparsely punctate. Anterior tibiæ smooth in front, very strongly tridentate, not crenulate above; spur slender, curvate; first tarsal joint very short. Posterior femora sparsely punctate; tibiæ with unequal spinules, the first tarsal joint not longer than the two following together.

This species belongs to Group I of Dr. Horn and resembles *A. militaris*, LeConte, but is larger and has the sides of thorax distinctly explanate and the posterior angles are distinct, although obtuse. It differs from *A. rudis*, LeConte, in having distinct basal margin of thorax and different punctuation.

Length, 6.5 mm. One example, Los Angeles, California, collected by Mr. D. W. Coquillett.

Type.—No. 560, U.S.N.M.

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OCHODÆUS MANDIBULARIS, new species.

Oval, pale ferruginous. Mentum elongate, convex, only impressed at apex. Prosternum short, mandibles strongly but obtusely angulated on exterior margin just before middle. Clypeus with rounded, simple margin; at base with a strong acute horn; frontal suture indistinct. Front sparsely, moderately, finely punctate, not rugose; vertex without ridge. Thorax densely punctato granulate, a round impression at side and median line impressed at basal half. Elytra striate; striæ punctate; intervals feebly convex, punctate; sutural angles obtuse. Ventral surface sparsely punctate. Femora simple; hind tibiæ slender, strongly fimbriate; first tarsal joint as long as the three following, slender, slightly curvate.

Length, 7mm. One example, collected July 19 at Winslow, Arizona (Wickham).

Type.—No. 561, U.S.N.M.

Resembles *O. frontalis*, LeConte, in form and color, but is larger and distinct by the arcuate clypeus, the dentate mandibles, the strong frontal horn, situated higher up on the front than the small clypeal tubercle in *O. frontalis*, and the total absence of vertical carina. I have seen an exactly similar specimen from Las Cruces, New Mexico, in the collection of Messrs. Hubbard and Schwarz.

BRADYCINETUS MINOR, new species.

Dark ferruginous; head, margins of thorax and elytra, suture, tibiæ and tarsi darker. It differs from *B. hornii*, Rivers, in possessing a larger antennal club; clypeus and front more narrow in proportion to their length, the former with margin less rounded, subangulate at the sides; thorax more shining, somewhat more sparsely punctate; scutellum more narrow and smooth; elytral striæ distinctly more coarsely, less closely punctate; intervals narrow, convex. Hind tibiæ, spurs, carinæ of head and thorax, the form and lateral margin of the latter exactly as in the female of *B. hornii*. Middle tarsi with first joint as long as the two following together (in *B. hornii*, as the three following).

Length, 7.5mm. One female collected by Mr. E. A. Schwarz at San Diego, Texas, May 26, 1895.

Type.—No. 562, U.S.N.M.

Bolboceras farctus and *B. tumefactus* of our lists have the eyes completely and broadly divided and should not be congeneric with *B. lazarus*, Fabricius.

GYMNOPYGE, new genus.

(Group *Dichelonychini.*)

Mouth parts, ventral segments, and coxæ of same structure as in Dichelonycha. Elytra short; humeral umbone prominent; base conjointly, broadly emarginate; side margins expanded vertically or

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broadly lobed at basal half, strongly convergent posteriorly; apices separately rounded. Wings ample (in all three species). Propygidium entirely exposed. Body short, in front narrowed more or less strongly. Abdomen gibbous. Legs, and especially tarsi and claws, less elongate. Posterior tibiæ short and stout, with an oblique spinous ridge behind middle on the exterior side, and lower edge serrate and spinous.

Type.—G. hopliæformis, new species.

GYMNOPYGE HOPLIÆFORMIS, new species.

Oval, strongly narrowed in front, brownish testaceous, head and thorax piceous, hirsute with whitish hairs, longer on ventral surface; long, appressed, white hairs on sides of abdomen and propygidium. Antennæ 9-jointed, ferruginous; club black. Head rugosely punctate; clypeus short, separated by a straight impressed suture; margin strongly reflexed, truncate in front; side angles rounded. Thorax strongly convex, broader than long, emarginate at apex; sides obtusely subangulate just behind the middle; hind angles very obtuse; base arcuate; disk coarsely but not densely punctate, a long hair arising from each puncture. Scutellum broad, rounded, punctate. Elytra rugosely punctate and hairy; sutural stria somewhat distinct and traces of three or four more striæ on the disk. Propygidium finely punctate, densely covered with long appressed white hairs; pygidium convex, shining, sparsely punctate at base, smooth at apex. Ventral surface sparsely and finely punctate. Metasternum at sides more coarsely punctate. Front tibiæ with upper tooth obsolete; hind tibiæ very stout, asperately punctate and coarsely serrate on the inferior margin; tarsi short, claws moderately long.

Length, 5 to 6 mm. Numerous examples collected by Mr. D. W. Coquillett in Mohave Desert, Kern County and Los Angeles County, California. An individual from San Diego is entirely black, but does not differ otherwise.

Type.—No. 563, U.S.N.M.

GYMNOPYGE PYGMÆA, new species.

Elongate oval, sparsely hirsute, narrowed in front, pale ferruginous. Antennal club black. Head piceous, thorax infuscate. Antennæ 8-jointed; claws of posterior tarsi short; anterior tibiæ distinctly tridentate. Elytra sparsely, irregularly subseriately punctate.

Length, 5 mm. Two examples, southwestern Utah. (From Charles Palm, of New York.)

Types.—No. 564, U.S.N.M.

GYMNOPYGE COQUILLETTI, new species.

Oval, hirsute, narrowed in front, pale ferruginous. Antennal club and head piceous, tarsi slightly infuscate. Differs from *G. hopliæformis* in larger size, more elongate form, head cribrate with indistinct clypeal

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suture, anterior tibiæ tridentate, antennæ 8-jointed, scutellum more narrow, not transverse, and hind tibiæ hardly as stout. Elytra subrugosely punctate, with faint traces of striæ.

Length, 7 mm. One example, Colorado Desert, San Diego County, California, collected by Mr. D. W. Coquillett.

Type.—No. 565, U.S.N.M.

DIPLOTAXIS RUFA, new species.

Ovate, slightly broader behind, rufoferruginous, shining; glabrous above. Front and clypeus convex, cribrately punctate; the latter subrectangular, truncate, margin narrow, but distinctly reflexed. Antennæ testaceous, 10 jointed, club as long as the funicle. Thorax one-half broader than long, narrowed in front, coarsely, moderately closely punctate; sides obtusely subangulate at middle, slightly sinuate before and behind; angles acute; impressions at the angles feeble. Scutellum sparsely punctate. Elytra coarsely, but not very densely, punctate; striæ regular at the sides; punctures confused on the intervals; costæ with a series of minute punctures. Pygidium and ventral surface coarsely punctate, the punctures with short hairs. Legs setose, femora sparsely, moderately coarsely punctate; tibiæ, especially of the posterior legs, roughly punctate; the anterior tibiæ with upper tooth very small, the others strong, acute; the anterior tarsi moderately long; the middle tarsi very long and the posterior tarsi short, with basal joint incrassate, roughened; claws cleft, the inferior part broader, with recurved apex.

Length, 9 mm. Three examples, Georgiana, Florida.

Types.—No. 566, U.S.N.M.

This species resembles *D. subcostata*, Blanchard, in the form of thorax, but is smaller, has the thorax less constricted and more coarsely punctured, and the convex cribrose head with truncate clypeus is entirely different.

Note.—In comparing the original descriptions, I have come to the conclusion that *Diplotaxis castanea*, Burmeister, is identical with *D. subcostata*, Blanchard, *D. georgiæ*, Blanchard, with *D. liberta*, Germar, and *corpulenta*, Burmeister, with *D. tristis*, Kirby. The last-mentioned names in each case have the priority.

LACHNOSTERNA ELONGATA, new species.

(Group *Ephelida*, Horn.)

Very elongate, cylindrical, finely and sparsely pubescent; rufotestaceous, moderately shining. Head as broad as anterior margin of thorax, infuscate, convex, densely and coarsely punctate, with margin moderately reflexed, distinctly emarginate. Antennæ 10-jointed. Thorax rather short, evenly convex, finely and densely punctate; sides strongly arcuate and narrowed in front, parallel behind; anterior angles obtuse, posterior rectangular. Elytra subopaque, finely and densely, somewhat

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rugosely punctate, discal costæ feeble. Pygidium very convex, longer than broad, narrowed toward apex, rather coarsely, not densely punctate. Metasternum sparsely hairy, finely, not densely punctate. Claws with a feeble subbasal tooth.

Male.—Antennal club slightly longer than the stem. Abdomen slightly flattened; penultimate segment broadly emarginate, with the margin at middle depressed, slightly roughened; last segment truncate, vaguely concave, sparsely granulate. Fixed tibial spur very short; outer long, lanceolate. Claspers symmetrical, deeply bifid, the outer branch short, lateral, the inner branch long, straight, with a strong tooth toward apex on inner side.

Length, 16 mm. Two male examples, Florida, accession 23153 (from Charles Palm of New York).

Types.—No. 567, U.S.N.M.

LACHNOSTERNA PARVA, new species.

(Group *Ephelida*, Horn.)

Very elongate, cylindrical, dark brown, shining, glabrous above. Head piceous, short, moderately broad, deeply and sparsely punctate; clypeus short, concave, sparsely punctate, with margin moderately reflexed, feebly emarginate. Antennæ 10-jointed. Thorax short, evenly convex, sparsely and not coarsely punctate; lateral margins parallel behind, strongly rounded in front; anterior angles obtuse, posterior rectangular. Elytra rather coarsely, rugosely punctate; discal costæ very feeble. Pygidium narrowed toward apex, as long as broad, densely, moderately coarsely, punctate, smoother at apex. Metasternum densely and finely punctate, with long hairs. Abdomen sparsely and finely punctate. Claws with a small acute tooth before the middle.

Male.—Antennal club longer than the stem. Abdomen flattened along the middle; penultimate segment asperately rugose, broadly emarginate, obliquely plicate each side; last segment deeply concave at middle, with an elevated cusp each side near the margin within the concavity. Fixed spur very short, nearly atrophied; outer spur long, slender. Claspers symmetrical, short, undivided; apices triangular, obtusely pointed, grooved on the outside.

Length, 12 mm. Two male examples (accession 23853) from Mr. Charles Palm, of New York.

Types.—No. 568, U.S.N.M.

This species resembles *L. boops*, Horn, in size, color, and form, but has entirely different structural characters.

LACHNOSTERNA ALPINA, Schwarz, MSS.

(Group *Fusca-Fraterna*, Horn.)

Ovate, robust, broader behind, rufocastaneous, shining. Head small, slightly convex, piceous, moderately densely and finely punctate; clypeus flat, rather densely, not coarsely punctate; distinctly emar-

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ginate; margin narrowly reflexed. Thorax short, broadest at base; sides broadly rounded, serrate and sparsely ciliate; apex much wider than the head; anterior angles slightly produced: punctuation evenly distributed, moderately closely placed, rather fine; punctures feebly umbilicate. Scutellum sparsely and finely punctate. Elytra not fimbriate, finely, not closely punctate, transversely rugose near the suture and behind the humeral umbones. Pygidium transverse, sparsely and finely punctate. Metasternum very densely punctulate, with long, dense, yellow hairs. Abdomen sparsely and obsoletely punctulate. Posterior tibiæ slender, with very feeble ridges. Claws strongly curved; tooth submedian, small, acute. Last joint of maxillary palpi fusiform, not impressed.

Male.—Antennal club nearly as long as the stem. Abdomen flattened at middle; penultimate segment with a strong arcuate ridge, distant from apical margin; last segment with a cupuliform, smooth fovea. Fixed spur spatulate, about half as long as the slender exterior spur. The claspers recall those of *L. dubia*, Smith, but are much smaller and less twisted.

This species resembles *L. errans*, but has a different clypeus, much finer punctuation, nonfimbriate elytral margin, slender tibiæ and different sexual characters. (Note on habits, see Schwarz.[1])

Length, about 18 mm.

I have examined four male examples, collected near Alta, Utah, at an elevation of 9,000 to 11,000 feet, by Messrs. E. A. Schwarz and H. G. Hubbard. One has been presented to the National Museum by these gentlemen.

Type.—No. 569, U.S.N.M.

LACHNOSTERNA GRANDIOR, new species.

(Group *fusca-rugosa*, Horn.)

Robust, ovate, depressed above, rufocastaneous, shining. Head broad, very densely punctate; clypeus (as in *L. barda*, Horn) flat, densely punctate, deeply emarginate; margin narrowly but distinctly reflexed. Antennæ 10-jointed. Thorax very short and broad, slightly narrowed behind, coarsely and densely, but not confluently, punctate; punctures umbilicate; median line smooth; side margins serrate, subangulate at middle and convergent in front; anterior angles subobtuse. Elytra finely punctate, slightly rugose; sutural and marginal costæ well defined, the others obsolete. Pygidium rounded, sparsely, vaguely punctate. Metasternum densely punctate, with long, moderately dense hairs. Abdomen sparsely and finely punctulate. Claws with a strong median tooth. Last joint of maxillary palpi fusiform, not impressed.

Male.—Antennal club as long as the stem. Abdomen flattened at middle; penultimate segment broadly emarginate, with a strongly elevated rugulose, arcuate ridge, behind which is a deep, broad excava-

[1] Proc. Ent. Soc. Wash., II, p. 242.

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tion; last segment broadly concave. Fixed spur triangular, acute; exterior spur one-half longer, slender. The claspers are unsymmetrical, highly developed, associating the species with the *hornii-rugosa* group, but they are still more twisted than in any previously described species.

Length, 25 mm.

Type.—No. 570, U.S.N.M. One example, Shreveport, Louisiana; collected by F. W. Mally.

This species, the largest *Lachnosterna* in our fauna, resembles in form *L. quadrata*, Smith, but is much larger, has different clypeus and punctuation, but thorax particularly distinguishes them, being subangulate and crenulate in *L. grandior*.

LACHNOSTERNA RUGOSIOIDES, new species.

(Group *fusca-rugosa*, Horn.)

Oblong, broader behind, moderately robust, rufocastaneous, shining. Antennæ 9-jointed. Clypeus densely and coarsely punctate, acutely emarginate; margin narrowly reflexed. Front somewhat less densely, coarsely punctate. Thorax widest at middle, obtusely angulate at sides, narrowed at base, more obliquely narrowed in front; margin slightly crenulate, sparsely ciliate; disk convex, moderately closely, coarsely punctate; punctures umbilicate; the median line and small spaces on each side smooth. Elytra finely punctate, rugulose; discal costæ obsolete. Pygidium longer than in *L. rugosa*, convex, very shining, sparsely and finely punctate. Metasternum densely punctate, with sparse short hairs. Abdomen sparsely, obsoletely punctulate. Claws very strongly curved, with a strong median tooth.

Male.—Antennal club very short. Abdomen flattened at middle; penultimate segment with a straight, acutely elevated, overhanging, transverse ridge at middle, and the posterior margin broadly and deeply concave; last segment concave, asperately granulate; fixed spur very long, slender, fully equal in length to the exterior spur. Claspers after the type of *L. rugosa*, but differently twisted, and the extreme apices prolonged, acute, and recurved.

Length, 18 mm. One example, collected by myself on Long Island, New York.

Type.—No. 571, U.S.N.M.

This species resembles superficially a small *L. rugosa*, but is abundantly distinct by the characters above.

LACHNOSTERNA MINOR, new species.

(Group *balia*, Horn.)

Oblong, slightly broader behind, glabrous above, rufotestaceous, shining; head and thorax darker. Clypeus acutely, but not deeply, emarginate, moderately closely, not coarsely, punctate; margin rather narrowly reflexed. Front more densely punctate. Antennæ 9-jointed. Thorax convex, narrowed in front; sides regularly arcuate from base,

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not crenate; disk moderately closely and coarsely, somewhat irregularly, punctate; basal channel distinct at the sides. Elytra alutaceous, slightly rugulose; punctures finer and more closely placed than those of thorax. Pygidium sparsely and finely punctulate. Metasternum finely and densely punctulate, with long yellow hair. Abdomen sparsely punctulate at the sides; punctures with short hairs. Claws arcuate, with a strong median tooth. Last joint of maxillary palpi fusiform, not impressed.

Male.—Antennal club as long as the stem. Abdomen longitudinally concave; penultimate segment with a deep semicircular fovea, each side of which is an oblique elevated cusp; last segment with an impressed line at middle. Fixed spur nearly half the length of the exterior one, strongly curvate. Claspers with the apices long, slender, acute, strongly curvate, simple on the right, and with a strong inferior basal hook on the left.

Length, 13 mm. One example collected by Mr. F. F. Crevecoeur, Onaga, Kansas.

Type.—No. 572, U.S.N.M.

What Professor Smith[1] figures as *Lachnosterna fraterna*, female, is the female of *L. nova*, Smith. The real female of *L. fraterna* has the pubic process furcate at apex, after the manner of *L. bipartita*, but not quite as deeply.

A male of *Lachnosterna diffinis*, Blanchard, collected by Miss Etta Braly at Fayetteville, Arkansas, has the antennæ 10-jointed.

PHYTALUS CAVIFRONS, new species.

Male.—Elongate, cylindrical, shining, pale rufotestaceous. Head darker in color, broad; eyes large; front convex, moderately coarsely, not densely punctate; clypeal suture strongly biarcuate, very deeply impressed from eye to eye; clypeus concave, sparsely punctate; margin broadly reflexed, rounded at the sides, slightly emarginate at middle. Antennæ 10-jointed, second joint globose, third, fourth, and fifth cylindrical; sixth and seventh transverse; club as long as the funicle. Last joint of maxillary palpi large, flattened above, subtruncate at apex. Thorax a little more than twice as wide as long, a little narrowed in front; sides arcuate at middle, not crenulate; base without impressions, finely margined; disk convex, regularly, sparsely, rather finely punctate. Elytra slightly wider than thorax, sparsely and finely punctate; sutural costa well marked; discal costæ distinct, smooth; submarginal obliterated. Pygidium convex, sparsely, vaguely punctate. Prothorax beneath sparsely, not deeply, punctate. Metasternum very sparsely clothed with short hairs, sparsely punctate at middle, a little more densely at sides. Abdomen convex, very sparsely hairy, almost smooth at middle, sparsely punctulate at sides; last segment with a cupuliform fovea. Legs long and slender, anterior tibiæ

[1] Proc. U. S. Nat. Mus., XI, pl. LIV, fig. 43.

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obtusely tridentate, upper tooth small, apical tooth in the axis of the tibia, obtuse at apex. Posterior femora compressed; tibiæ with an oblique fine acute ridge at middle, furnished with long, slender, not closely set spines; basal ridge very short, with two or three small spines; apex squarely truncate exteriorly, with a dense row of fine spines; spurs movable, obtuse at apex; the exterior one somewhat longer. Tarsi, especially on the front legs, much longer than the tibiæ, clothed beneath with dense, long, somewhat stiff hairs. Claws subequally cleft, inferior part a little broader and oblique at apex.

Length, 12 mm. Two examples, collected May 24, 1895, by C. H. Tyler Townsend, at Brownsville, Texas.

Types.—No. 573, U.S.N.M.

Female.—Differs from the male described above as follows: Color darker ferruginous, infuscate on head and thorax, punctuation distinctly coarser throughout, clypeus less concave, coarsely and densely punctate. Antennal club slightly shorter. Pygidium longer, gibbose at middle. Last ventral convex, subemarginate at apex. Legs shorter and stouter; anterior tibiæ with upper tooth stronger, apical tooth obliquely truncate and notched at apex; posterior tibial spurs longer, more lanceolate.

One example, collected June 11, at Brownsville, Texas, by Prof. C. H. Tyler Townsend.

Type.—No. 574, U.S.N.M.

LISTROCHELUS PULCHER, new species.

Male.—Ovate, distinctly broader behind, dark rufocastaneous, densely covered with a silvery-gray coat, except the head, disk of thorax, humeral umbones, apex of pygidium and legs; clothed with sparse, short hairs in the punctures. Front flat, densely and coarsely, not confluently punctate; clypeal suture finely impressed, bisinuate; clypeus concave, less densely punctate; margin semicircularly rounded and broadly reflexed. Antennæ ferruginous, 10-jointed; club longer than the funicle. Thorax nearly twice broader than long, narrower at apex, convex, shining on the glabrous median part, regularly, moderately densely, not coarsely, punctate; sides regularly arcuate, feebly serrate and fimbriate with long hairs; angles obtuse. Elytra moderately coarsely, sparsely punctate; costæ obsolete; margin sparsely fimbriate. Pygidium convex, sparsely punctulate, subtruncate at apex. Metasternum and the coxæ clothed with long, dense, yellowish white hairs. Abdomen sparsely and finely punctulate; second and third segments slightly concave at middle, fourth with a median transverse gibbosity, longitudinally strigose; fifth gibbous at base, on the sides with two or three oblique elevated carinæ, strongly constricted on apical half; sixth short, transversely constricted, with sparse hair-bearing punctures; apical margin ciliate. Legs moderately stout, sparsely bristly; anterior tibiæ strongly tridentate. Posterior tibiæ scarcely fimbriate.

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Spurs rather slender, outer broader and longer, with pellucid margin. Posterior tarsi longer than the tibia; first joint stout, constricted at base. Claws pectinate along a double margin; outer anterior claw with a strong tooth near the apex.

Length, 17 mm. One example, collected by C. M. Porter, in Skidmore, Texas, April 2, 1895.

Type.—No. 575, U.S.N.M.

Female.—Form, size, and sculpture of the male, but differs as follows: Antennal club slightly shorter. Thorax with a median white line at base. Pygidium flat, deeply, longitudinally channeled before apex, with coarse setigerous punctures at and near the margin. Abdomen very convex, broadly glabrous and polished along the middle; fifth segment constricted at the sides, with a round gibbosity at middle near apical margin and with a transverse row of setigerous punctures behind the gibbosity, interrupted at middle; sixth very short, coarsely punctate. Anterior and middle claws with a strong tooth near apex and coarsely serrate at base. Posterior claws dissimilar, the inner without tooth, pectinate, the outer like the anterior claws.

One example, from Texas, in collection of Mr. H. Ulke.

This species differs from *L. mucoreus*, LeConte, by its color, broader form, distinctly broader thorax, more concave and rounded clypeus, and the sexual characters of abdomen and pygidium.

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OBSERVATIONS ON THE DEVELOPMENT AND MIGRATION OF THE URTICATING ORGANS OF SEA NETTLES, CNIDARIA.[1]

By Louis Murbach, Ph. D.

Visitors to the seashore have frequently had opportunity for becoming more or less acquainted with Sea Anemones, Jelly-Fishes, or even the large Portuguese Man-of-War, and other Siphonophora.

If the arms (tentacles) of the former, or the long capturing filaments of the latter, have been touched, inadvertently or through a more careful examination, a burning stinging sensation was experienced where the tentacles came into contact with the more delicate skin of the hands or other parts of the body.

These animals not only can make it unpleasant for their enemies, but by the same means can also overcome their prey. The ability to exercise this offensive and defensive warfare is due to the possession of very minute weapons called *nettling organs*. The observer has now become familiar with a most important function in the economy of these animals—that of nettling—which serves both as a means for gaining their livelihood and for their protection.

It is a suitable recognition of this power, that those groups of the Cœlenterata possessing it have been called Cnidaria.

The nettling organs can be studied satisfactorily only with the microscope, as they are single-celled organs and consequently very minute. They are situated in the outer cell layer, the ectoderm of the tentacles, or on special filaments—the acontia of the Actiniæ in the gastric cavity—the pertinent tissues of which are derived from the ectoderm.[2]

[1] This paper is to constitute a brief report of those results, obtained during my occupancy of the Smithsonian table at the Naples Zoological Station, which it was thought would prove of interest to the public. The table was occupied from April 25 to June 25, 1894.

[2] I believe it is still generally held that the nettling organs of the mesenterial filaments of the *Actiniæ* are of endodermic origin. But at the time this work was done I came across a paper of Boveri's (Ueber Entwickelung und Verwandschaftsbeziehungen der Actinien; Zeit. f. wiss. Zool., XLIX, Pt. 3, 1890) confirming the view formerly held by Heider (Ein Beitrag zur Anatomie der Actinien; Sitz'ber. d. Acad. d. Wiss., Wien; LXXIX, 1879) that the mesenterial filaments are of ectodermic origin, being derived from the lining of the gullet. This would place the origin of the nettling organs of all Cnidaria from the ectoderm. I can not find that this application has before been made, yet it can not, I should suppose, so long have been overlooked.

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Their position on the surface of the tentacles is generally marked by a hair-like projection—*the cnidocil*—where nettling organs stand singly. In some cases the organs are collected at the tips of the tentacles in the form of *nettling knobs*, and in others they are grouped on smaller branches of the capturing filaments in the form of *nettling batteries*. In the latter case cnidocils are seldom present.

The *nettling organs* consist essentially of a nucleated, more or less *modified, cell*, the *cnidoblast*, which contains a capsule, *the nematocyst*, inclosing a much coiled hollow thread—*the nettling thread*.

The cell-body is somewhat cup or goblet shaped, having, however, only a small aperture at the top, for the discharge of the little weapon. At the side of this opening the cnidocil stands, and at the opposite end, the cell-body is drawn out in the form of a foot or *stalk*. In the lower Cnidaria this stalk is simple, but in some of the more specialized forms of the Siphonophora the stalk and the lower portions of the cell-body contain *spiral contractile fibers*.[1]

The nucleus of the cell is almost always in a mass of granular protoplasm—the base of the goblet-shaped part—just at the side or under the capsule, which is contained in the hollow of the goblet.

The nematocysts may be spherical, oval, or cylindrical. Each is a *double-walled capsule*, transparent enough to enable one to see the fluid contents and the tortuous thread within. The outer wall is very thick, and similar to chitin. The opening in its end comes just under the opening of the cell-body. The very thin inner wall is closely applied to the outer wall, and, passing through the opening in this, becomes insensibly continuous with the nettling thread.

The hollow nettling thread, in its resting condition, is turned, outside in, back into the nematocyst, lying coiled up more or less regularly in the fluid contents of the latter. In this condition its present lumen (the walls of which constitute its outer surface after discharge) is filled with a viscid fluid, which gives the discharged thread its adhesive and irritating character. The discharged thread is often twenty times longer than the longest diameter of the capsule. The thread of the spherical capsules is usually a simple slightly tapering tube, having on its outer surface three spiral rows of very fine barbs. In the case of the oval capsules, a widened cone-shaped basal portion is joined to the thread. A small intermediate piece bears some very small, backwardly directed spines, while on the basal portion near its junction with the intermediate piece there are three large spines directed backward. The thread of the cylindrical capsules differs principally from

[1] Heretofore the appearance caused by the spirals was mistaken for cross striations, and the parts in question were thought to represent cross striped muscle. But after finding the spiral filaments, I still wish to assert a muscular nature for them, as stated in a previous paper. Recently Schneider (Zool. Anz., No. 464) confirmed the presence of spiral structures in *Velella*, but he denies their contractile nature, without giving substantial reasons. Since spiral muscles are now found in Cephalopods, I hold to my interpretation.

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the last in having the greater portion of its basal part covered by long slender spines. In the discharged or evaginated condition, the thread is at least partially filled by the fluid contents of the capsule.

In order to *cause* the *nematocyst* to be *discharged*, a proper stimulus—a minute crustacean, or worm, or an enemy—must come into contact with the *cnidocil*, for it is the *sensory part* of the nettling organ. The stimulus at one cnidocil may be distributed by nerve connections to the surrounding nettling organs, thus inducing explosions *en masse*. Next the cell-body and stalk contract, and this double pressure on the nematocyst, is transmitted by its fluid contents to all parts of the thread within, and it begins to be evaginated from its basal part outward to its end, with explosive rapidity.[1] The thread newly shot out unites the two very efficient conditions, namely, a large adhesive surface enhanced by very minute barbs, and by a sticky substance which also acts as a poison.[2]

The nettling poison has never been chemically analyzed, but its nature has rather been inferred from its effect on other animals. It was formerly supposed by many to be somewhat similar to formic acid. The small animals that are caught by a Cnidarian as prey make a few convulsive movements and then are apparently dead and are ingested by their captor. Anyone may experience the effect of the fluid in a more marked degree than on the hands, if he will touch his tongue to the tentacles of a sea-anemone. It is not unlike the sensation perceived on touching the tongue to a freshly cut root of Indian turnip (*Arisæma triphyllum*), and may last several hours or a day. Indeed, Professor Leuckart records a case where a lead pencil which had some weeks previously been used in manipulating a siphonophore, on being accidentally touched to the tongue, caused this nettling.[3]

The above brief review of what is held at the present time on the anatomy and physiology of the nettling organs also contains the principal points of my recent paper on this subject.[4]

In that paper I reviewed the pertinent literature, and would refer those who desire a fuller account to it. The preceding has been given to make clearer what is to follow. For the same reason it may be well to briefly give my results from alcoholic material on the development and migration of nettling organs, as presented by the same paper.

[1] In alcoholic material one can occasionally cause the thread to be slowly everted by continuous pressure on the cover glass.

[2] By all authors before me, the noxious fluid was supposed to be contained in the nematocyst. Their chief argument for the belief that fluid flows from the capsule is, that the size of the capsule and thread is less after the discharge of the latter. This does not hold when we remember that the volume of the fluid in the capsule equals the volume of the capsule minus the volume of the contained thread. How could this fluid then, after evagination of the thread, fill both capsule and thread as tensely as before? Besides this, all of the authors since Mœbius, have left out of account the substance (fluid) that fills the lumen of the invaginated thread.

[3] Zur näheren Kenntniss der Siphonophoren von Nizza; Archiv f. Naturgesch., 1854.

[4] Archiv f. Naturgesch, Pt. 3, 1894 (one plate and one woodcut).

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These were:

1. The nettling organs are developed in cells derived from the ectoderm.[1]

2. The inner wall of the nematocyst originates from the nucleus and grows in the protoplasm around it.[2] In consequence of this growth, a lighter area of secreted matter forms around the growing inner wall. By the abstraction of water from the secreted matter it condenses and shapes itself to the inner wall, and becomes the outer wall of the nematocyst.[3]

3. The hollow thread grows in spirals around the nucleus, as a continuation of the inner wall of the nematocyst. The growing end is nearest the nucleus. These growths are looked upon as the result of the functional activity of the nucleus in the cell.

4. When the development of the thread is complete, chemical changes are assumed to take place in the cell, causing the outer wall of the nematocyst to become firmer, and abstracting enough water from the contents of the inner wall (exosmose), so that the diminished pressure within will cause the thread to be drawn into the nematocyst. The spiral growth of the thread, during its development, favors a similar arrangement in the nematocyst.

5. When the thread is wholly within the capsule, the latter is rotated in the cell, so that the opening in the outer wall is turned away from the nucleus, and comes to lie directly under the opening in the cell-body, for the discharge of the thread.

6. The nettling organs are developed in more proximal parts of the Cnidarian body (near the bases of the tentacles in Hydromedusæ, but on the basal portion of the polyps in Siphonophora), and reach their destination on the tentacles by active amœboid migration (*Hydræ*, etc.), or by displacement due to the rapid growth of the tissues (Siphonophora).

7. The stalks are probably outgrowths of the cell body, produced after the migration of the organs.

As these results were obtained from alcoholic material, save *Hydra* which was used fresh, it was very desirable to verify them on fresh and living marine animals, which I was enabled to do at Naples.

In an appendix to the paper above mentioned, I gave, as a sort of preliminary report, some of the principal results.

The presence of nettling organs in the higher Protozoa, in the Cnidaria, in the Turbellaria, and in the Gasteropoda, makes it seem desirable to compare the development, the structure, and the function of these organs in the groups named. With this in view, representatives of two of these divisions, not yet studied comparatively, have been collected.

[1] The Microtomist's Vade-Mecum, A. B. Lee, 3d ed., 1893.

[2] Eisig (Monogr. I. Capitelliden, p. 576). Perrier and Claparède hold that the nucleus is directly concerned in the origin and formation of the setæ of certain worms.

[3] I have since observed the stages of this process in *Physalia*.

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Methods.—First of all, living Hydroid material was gathered so as to examine the organs in their natural condition, and also to test my conclusions in regard to migration and development. As my previous observations had not taken into account the Actiniæ, they were first examined. Fresh cerata of living *Æolidiæ* were given some attention, and many specimens were preserved for later histological work.

The methods employed were largely those already in vogue and described, only modified enough to suit the circumstances.[1]

For the examination of living tissue, a bit was placed in sea water on a slide, and a very dilute solution of aqueous methylin blue was added. The mass was then either only slightly compressed under the cover glass, or it was first teased, and then the elements were further isolated under the cover glass by lightly tapping on the latter with a pencil or other suitable object, until the desired result was obtained.

For preservation, Hydroids were killed by quickly pouring over them, placed in as little sea water as would keep them expanded, an acidified solution of corrosive sublimate, in 30 or 50 per cent alcohol. After some minutes they were removed from this mixture to the diluted pure solution, left for one-quarter hour,[2] then transferred to 70 per cent alcohol for one hour, and finally put up in 80 per cent alcohol.

Small Actiniæ were similarly treated except that the solution for killing was first heated. On some of the larger Actiniæ the narcotization process was used previous to fixing, but with indifferent success.

The few Siphonophora preserved were treated essentially like the Hydroids, except that they were killed by pouring into the least possible quantity of sea water that would keep them expanded an acidified 10 per cent solution of copper sulphate, to which was added a little corrosive sublimate solution.

On some Turbellaria and on *Æolidiæ*, Kleinenberg's fluid worked well for killing and fixing. After thoroughly washing in 70 per cent alcohol they were placed into 80 per cent. Other *Æolidiæ* were treated quite like the Hydroids. On still others, dilute Flemming's fluid was used as a fixative, and with good success. For preserving the external form, killing with glacial acetic acid, added in abundance, and immediately removing to weak alcohol, proved most effective. Yet much depends on the proper manipulation of the animal while the tissues are fixing.[3]

The material to be sectioned was stained with Mayer's hæmalum, picro-carmine, or with borax-carmine.

Historical.—The question of the *transposition* of *nettling organs*, for they are rarely ever used at the point where they develop, has long been an interesting one. For the Siphonophora, bearing capturing filaments, it was long ago settled by Professor Leuckart,[4] that the

[1] The Microtomist's Vade-Mecum, A. B. Lee, 3d ed., 1893.

[2] This time varied, of course, depending on the size and nature of the object.

[3] One such well-preserved specimen is due to the skillful hand of Signor Lo Bianco.

[4] Zoologische Untersuchungen; I, Die Siphonophoren, 1853.

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used-up batteries and ends of the filaments, were replaced by the extensive growth (Nachschub) of the latter.

In *Velella*, Bedot,[1] later found canals filled with nettling organs extending from the great mass of developing nematocysts, under the so-called liver, to the outer layer of cells on the under side of the animal. But he did not consider the question of the manner of their transposition.

In *Hydra*, Nussbaum[2] believed that the movement of nettling organs, along the tentacles, was facilitated by the slightly twisted condition of the latter.

The reasons for my conclusion, previously stated, that the nettling organs propel themselves from place to place (excepting in the Siphonophora), were that I also found the canals which Bedot had seen in *Velella;*[3] but more than this, I found that the nettling organs are always turned with the basal, i. e., with the larger mass of protoplasm and nucleus, in the direction of motion, while the discharge pole points to the rear. Furthermore, that the fixed cell-body shows the amœboid form. Finally, that in many Hydroids one can frequently observe nettling organs lying parallel to the surface of the tentacles, their orientation as before described, showing that they are proceeding upward on the latter. This was further confirmed by the more careful drawings of two of the works consulted, one by F. E. Schulze[4] and the other by O. and R. Hertwig.[5]

Statement of results.—Now the *observations* of *living material* bring the most conclusive proof. From specimens of *Velella* to be examined, small pieces containing nettling organs were teased a little and lightly flattened under the cover glass. Many nettling organs showed amœboid changes of form. The movements were slow but definite. One case, however, which was observed for fifteen minutes, made such pronounced and rapid amœboid movements, that it might well have been taken for an *Amœba* which had swallowed a nematocyst.

As *Pennaria cavolinii* was easily obtainable, it was used as a representative of the Hydromedusæ. At first a hydranth was teased and placed with some sea water under a cover glass. The protoplasm of the nettling cells was in many cases passing through changes of form, but no definite locomotion was observable. In order not to mistake any rotation of the nettling organ for change of form, in this and all subsequent cases, the spines in the base of the thread were carefully observed simultaneously with the contours of the cell-body. For other

[1] Recherches sur l'organ central et le sytsème vasculaire de Velelles; Recueil zool. suisse, I, 1884.

[2] Ueber die Theilbarkeit d. leb. Materie, II; Archiv f. Micros. Anat., XXVII, 1887.

[3] According to his preliminary report (Zool. Anzeig., No. 464) Schneider has observed the same for *Porpita*.

[4] Ueber den Bau und die Entwickelung von Syncoryne Sarsii, 1873.

[5] Das Nervensystem und die Sinnesorgane der Medusen, 1878. Pl. V; fig. 26.

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observations the hydranths were simply placed in a little sea water under cover glass and gently flattened. A point was selected where a nettling organ, not far from the base of a tentacle, was slowly changing its form. It was observed for nearly one-half hour, the ectoderm cell boundaries being used as the nearest fixed points obtainable. The large mass of protoplasm containing the nucleus of the nematoblast was turned toward the tentacle. At the end of the stated time of observation, the organ had passed through a distance equal to its own diameter. In another case a nettling organ traveled toward a tentacle a distance equal to three times its diameter; meanwhile it twice turned up endwise. Another case particularly drew attention; the cell-body was changing its form quite rapidly, progressing at the same time between the ectoderm cells, keeping close to the mesoglœa. Many cases were observed where the nettling organs were lying parallel to the surface of the tentacles.

Other cases were observed where the nettling organs were turned in almost any direction, or again where they seemed to be reversed as if going toward the base of the tentacle, and many others in which I could detect no change of form or motion whatever. These exceptions, however, as well as the short distance traveled by the nettling organs in a given time, may find an explanation in the abnormal conditions to which the hydranths were subjected during the observations.

After the foregoing observations I feel warranted in reaffirming my previous conclusion, *that the active amœboid migration of the nettling organs is the manner in which they are transported from the point of their development to their destination.* Furthermore, I believe this will be found to apply also to all Cnidaria where similar conditions obtain as, for instance, to all except some of the Siphonophora.

In the limits of this paper it is not expedient to give a review of the literature on the origin and development of the nematocyst and thread. Suffice it to say that most of the authors heretofore agreed that the nematocyst and contents take their origin from a vacuole arising in the protoplasm of the nettle-cell. On the origin of the thread all the older authors are agreed that it arose in the nematocyst; some, from a mass of protoplasm that grew into the vacuole, and others believed it originated in the secreted contents of the nematocyst. Still another view was that both nematocyst and thread were derived from the mass of protoplasm that had grown into the vacuole. But later it was finally shown that the thread takes it origin outside the nematocyst, and consequently it must subsequently be invaginated into the capsule.

With the exception of one brief reference,[1] this fact in regard to the position of the growing thread was not applied to the Actiniæ. It was therefore desirable to learn to what extent my observations on Hydroids applied to these.

[1] Schneider, Einige hist. Befunde an Cœlenteraten; Jen. Zschr. f. Nat. 27, N. F. 20, 1892.

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As already stated, I demonstrated that the *nematocyst is* of *heterogeneous origin;* the inner wall being derived from the nucleus, while the outer one results from the secretions arising around the former during its growth. Also that *the thread develops around the nucleus* of the cell, and *not* around the wall of the nematocyst, as has been heretofore held.

These points were now *reexamined in living and fresh material*, especially in Siphonophora and in Medusæ. The Actiniæ were also preliminarily examined. The same course of development as has been described from alcoholic specimens could now be most beautifully observed, the thread being slightly stained by methylin blue. With the nucleus somewhat stained the observation was very easy and decisive.

In the Actiniæ observation becomes much more difficult, because of the small size of the nettling organs of most of them. *Anemone sulcata*, then at hand and a sufficiently typical specimen, was first examined. The early stages of both capsule and thread resemble very closely those of the cylindrical ones of the Siphonophora. The inner wall of the nematocyst early takes on a curved form, the nucleus with encircling thread lying in the concavity. The spirals of the thread do not seem to be so regular as those of the Hydrozoa examined. But they could be seen in greater number. By inducing a current under the cover glass the observation may be made more certain, because different views of the nematoblast are thus obtained. Both *Adamsia rondeletii* and *Astroides calycularis* were sufficiently examined to confirm what I had observed in the other form. The latter is not a suitable form for this work, on account of the minuteness of its nettling organs.

It is my intention to subject this matter to a more thorough examination in Actiniæ; but even now I believe we are warranted in concluding *that the development of the nettling organs is the same for all the Cnidaria.*

The *Turbellaria* collected have not yet been examined for the development of their nettling organs, in the light of these newer observations; though in one form previously obtained at Leipzic, some apparently undeveloped nematocysts were found, that lead me to look for a similar plan of development to that already established for the Cnidaria.

The *Æolidia* obtained at Naples are under investigation, but so far no results are definite enough to be stated.

In conclusion I wish to thank the Director, Dr. Dorn, for courtesies while at the Naples Zoological Station, also the Secretary of the Smithsonian Institution, and the committee in charge, for the privilege of occupying the table.

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LIST OF THE LEPIDOPTERA COLLECTED IN EAST AFRICA, 1894, BY MR. WILLIAM ASTOR CHANLER AND LIEUTENANT LUDWIG VON HÖHNEL.

By W. J. HOLLAND, Ph. D.

THE collection submitted to me for examination and determination by the authorities of the United States National Museum had already been partially classified by Mr. Martin L. Linell, of the Department of Entomology. Twenty-five species recorded in the accompanying list were not represented in the assemblage of specimens submitted to me, Mr. Linell having determined them, as he writes me, upon careful comparison with specimens previously labeled by me in other collections contained in the National Museum. The species thus determined by Mr. Linell, which I have not personally examined, and for the correct determination of which I rely upon him, are *Papilio leonidas*, *P. nireus*, *P. demoleus*, *Salamis anacardii*, *Palla varanes*, *Amauris dominicanus*, *Hypolimnas misippus*, *Danais petiverana*, *D. klugii*, *Tingra mombasæ*, *Precis natalica*, *P. elgiva*, *P. cloantha*, *Euphædra neophron*, *Melanitis leda*, *Hamanumida dædalus*, *Pyrameis cardui*, *Eurytela dryope*, *E. hiarbas*, *E. ophione*, *Hypanis ilithyia*, *Junonia boopis*, *J. cebrene*, *J. clelia*, *Callidryas florella*, *Terias regularis*, and *Cydligramma latona*.

As to the exact localities from which the specimens came, I have no certain knowledge. Mr. Linell writes that he was informed by Mr. Chanler that the greater number of the specimens were taken upon the Jombene Range, northeast of Mount Kenia. It is to be regretted that a more exact record of localities and dates of capture was not kept.

An examination of the list shows that while a certain proportion of the species therein enumerated have a wide range over the whole of tropical Africa, a much larger proportion are such as belong to the faunal subdivision which includes the region covered by Natal and the Transvaal. The study of collections from Eastern Africa is revealing to us gradually that there is a rather well-defined line of demarcation between the species occupying the region of the grassy steppes, which extend through the southern part of the continent northward along the eastern coast, and the fauna of the more densely wooded region of the Congo, the Ogové, and their tributaries. The butterflies of the region of Kenia and Kilimanjaro are more nearly related to those of the region of the Cape than to those of tropical West Africa. Dr. R. Bowdler

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Sharpe[1] has given us a most instructive paper upon "The zoo-geographical areas of the world." This eminent ornithologist has recorded a distinction between what he delimits and names as the "South African Sub-Region" and the "East African Sub-Region." He, however, says that "the East African Sub-Region is not a very natural division, and may have to be sunk in one of the others." With this view my study of a number of the collections of lepidoptera made in recent years in Eastern Africa leads me to concur very positively. So very large a proportion of the lepidoptera taken in tropical East Africa also occur in the region of Natal and the Transvaal that it seems to me that it is but natural, at least from an entomological standpoint, to sink the two subregions into one, which might be designated as the Southeastern African Sub-Region. It is characterized especially by the great development of the *Acraeas* of the Horta group, and the numerous species of the genus *Teracolus*, which are but sparingly represented elsewhere upon African soil, and are altogether wanting from the hot wooded valleys of the Equatorial region.

Suborder RHOPALOCERA.

Family NYMPHALIDÆ, Swainson.

Genus DANAIS, Latreille.

DANAIS CHRYSIPPUS, Linnæus, var. KLUGII, Butler.

Limnas klugii, BUTLER, Proc. Zool. Soc. Lond., 1885, p. 758.

Mr. Linell reports three examples of this species in the collection.

DANAIS PETIVERANA, Doubleday.

Danais limniace, CRAMER, var. *petiverana*, DOUBLEDAY and HEWITSON, Gen. Diurn. Lep., p. 93, pl. XII, fig. 1 (1847).

Danais leonora, BUTLER, Proc. Zool. Soc. Lond., 1862, p. 51; Lepid. Exot., p. 53 pl. XX, fig. 2.

Mr. Linell reports ten specimens in the collection.

DANAIS FORMOSA, Godman.

Danais formosa, GODMAN, Proc. Zool. Soc. Lond., 1880, p. 183, pl. XIX, fig. 1.

There is a single example of the male of this exceedingly beautiful species, which is still excessively rare in collections, and is mimicked by the wonderful *Papilio rex*, Oberthür.

Genus AMAURIS, Hübner.

AMAURIS DOMINICANUS, Trimen.

Amauris dominicanus, TRIMEN, Trans. Ent. Soc. Lond., 1879, p. 323; S. Afr. Butt., I, p. 61 (1887).

Mr. Linell reports nine specimens of the male in the collection.

[1] Natural Science, August, 1893.

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AMAURIS ECHERIA, Stoll.

Papilio echeria, Stoll, Suppl. Cram. Pap. Exot., p. 29, figs. 2, 2b (1791).
Amauris echeria, HÜBNER, Verz. Bek. Schmett., p. 14 (1826).
Danais vaillantiana, GODART, Encyc. Meth., IX, p. 183 (1819).
Amauris echeria, TRIMEN, S. Afr. Butt., I, p., 57 (1887).

There is a single male specimen of this species. In the lot were several females of *Papilio echerioides*, Trimen, which is a most excellent mimic of this species.

AMAURIS OCHLEA, Boisduval.

Euplœa ochlea, BOISDUVAL, App. Voy. de Deleg. dans l'Afr. Austr., p. 589 (1847).
Amauris ochlea, TRIMEN, S. Afr. Butt., I, p. 60 (1887).

There are three males and one female of this species contained in the collection.

Subfamily SATYRINÆ, Bates.

Genus MELANITIS, Fabricius.

MELANITIS LEDA, Linnæus, var. SOLANDRA, Fabricius.

Papilio leda, LINNÆUS, Syst. Nat., I, 2, p. 773, n. 151 (1767).
Papilio solandra, FABRICIUS, Syst. Ent., p. 500, No. 244 (1775).

Mr. Linell reports five specimens of this species in the collection.

Genus GNOPHODES, Westwood.

GNOPHODES DIVERSA, Butler.

Gnophodes diversa, BUTLER, Ann. and Mag. Nat. Hist. (5), V, p. 333 (1880).
Melanitis diversa, TRIMEN, S. Afr. Butt., I, p. 116 (1887).

The collection contains twelve examples of this species.

Genus MYCALESIS, Hübner.

MYCALESIS SAFITZA, Hewitson.

Mycalesis safitza, HEWITSON, Gen. Diurn. Lep., p. 394, pl. LXVI, fig. 3 (1851); Exot. Butt., III, p. 80, pl. XL, fig. 4 (1862).—TRIMEN, S. Afr. Butt., I, p. 105.

There are thirty-two specimens of this species, showing that it is abundant in the region where the collection was made.

MYCALESIS PERSPICUA, Trimen.

Mycalesis perspicua, TRIMEN, Trans. Ent. Soc. Lond., 1873, p. 104, pl. I, fig. 3; S. Afr. Butt., I, p. 107 (1887).

Seven specimens.

Genus YPHTHIMA, Hübner.

YPHTHIMA ASTEROPE, Klug.

Hipparchia asterope, KLUG, Symb. Phys., pl. XXIX, figs. 11–14 (1832).
Yphthima asterope, HEWITSON, Trans. Ent. Soc. Lond. (3), II, p. 283 (1865).—TRIMEN, S. Afr. Butt., I, p. 66 (1887).

There are three very badly damaged specimens of this species, which is widely distributed throughout Africa and Asia.

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YPHTHIMA HŒHNELI, new species.

Male.—Upper side uniformly grayish brown; fore wing with a large, oval, bipupilled ocellus; hind wing with three ocelli, of which the one nearest the anal angle is small and obsolescent, the other two, situated one on either side of vein 2, are relatively large. On the under side both wings are wood-brown, finely striolated with pale yellowish gray. The striæ are less numerous below the ocellus of the primaries, on the basal third of the secondaries, and on either side of the submarginal series of seven ocelli, which are found also on the secondaries. These tracts in consequence of this lack of the lighter striæ are darker brown than the rest of the wings. The seven ocelli of the secondaries are of moderate size, two of them located between veins 1 and 2 near the anal angle, and one on each of the succeeding interspaces, that nearest the outer angle being the smallest and inclining to obsolescence. All of the ocelli on the under side are pupilled with silvery blue. The iris of the large subapical ocellus of the primaries is relatively wide and bright yellow. The irides of the ocelli of the secondaries are reddish ochraceous. Expanse, 30 mm.

Type.—No. 50, U.S.N.M.

There are two specimens of this species in the Chanler collection, both in a more or less damaged condition, but sufficiently good to permit of an accurate description. The cotype (No. 51, U.S.N.M.) differs from the type in having the ocelli on the under side of the secondaries smaller than in the type and inclining to obsolescence.

Genus NEOCŒNYRA, Butler.

NEOCŒNYRA DUPLEX, Butler.

Neocœnyra duplex, BUTLER, Proc. Zool. Soc. Lond., 1894, p. 560, pl. XXXVI, fig. 1.

There is one badly damaged specimen of this species.[1]

Subfamily ACRÆINÆ.

Genus ACRÆA, Fabricius.

ACRÆA HORTA, Linnæus.

Papilio horta, LINNÆUS, Mus. Lud. Ulr. Reg., p. 234; n. 53 (1764); Syst. Nat., Ed. XII, p. 755, n. 54 (1767).

Acræa horta, GODART, Enc. Meth., IX, p. 231, n. 1 (1819).—TRIMEN, S. Afr. Butt., I, p. 134 (1887).

There are six examples referable to this species.

[1] The species named by me *Yphthima chanleri*, Proc. U. S. Nat. Mus., 1895, XVIII, 1895, p. 240, I discover to be identical with a species named *Neocœnyra gregorii*, by Dr. Butler in the Proceedings of the Zoological Society for 1894. The reference of the insect to Dr. Butler's genus is what misled me. *Neocœnyra* is differentiated from *Mycalesis* by the absence of any swelling at the base of the median vein. It is a very slight basis upon which to create a generic distinction.

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ACRÆA NATALICA, Boisduval.

Acræa natalica, BOISDUVAL, App. Voy. de Deleg. dans l'Afr. Austr., p. 590, n. 57 (1847).

There are numerous examples of this species, male and female, showing that it is quite common in the region visited by the explorers.

ACRÆA ACARA, Hewitson.

Acræa acara, HEWITSON, Exot. Butt., III, pl. VIII, figs. 19, 20 (1865).
Acræa caffra, FELDER, Reise d. Nov. Lep., II, p. 369, pl. XLVI, figs. 10, 11 (1865).
Acræa acara, TRIMEN, S. Afr. Butt., I, p. 159 (1887).

Three males and four females.

ACRÆA ENCEDON, Linnæus.

Papilio encedon, LINNÆUS, Mus. Lud. Ulr. Reg., p. 244, n. 63 (1764).
Papilio encedonia, LINNÆUS, Syst. Nat., I, 2, p. 762, n. 90 (1767).
Papilio lycia, FABRICIUS, Syst. Ent., p. 464, n. 94 (1775); Ent. Syst., III, 1, p. 176, n. 546 (1793).
Acræa sganzini, BOISDUVAL, Faune Ent. de Madgr., p. 34, pl. 6, figs. 6, 7 (1833).
Acræa usagaræ, VUILLOT, Bull. Ent. Soc. France, 1891, p. lxxviii.

The collection contains numerous specimens of this species. Mr. Trimen sinks *A. sganzini*, Boisduval, as a synonym of *A. encedon*, Linnæus. I have reluctantly been compelled with the growth of material in my possession to come to the same conclusion. *A. usagaræ*, Vuillot, is an extreme form of *sganzini*, Boisduval, in which the white transapical band is entirely suffused with the brownish red color of the wings and the spots are largely obsolescent, though identical in arrangement and form with those found in normal specimens. The most of the specimens in the collection made by Lieutenant von Höhnel are typical *A. encedon*, Linnæus.

ACRÆA INSIGNIS, Distant.

Acræa insignis, DISTANT, Proc. Zool. Soc. Lond., 1880, p. 184, pl. XIX, fig. 6.
Acræa buxtoni, HEWITSON (nec BUTLER), Ent. Mon. Mag., XIV, p. 155.
Acræa balbina, OBERTHÜR, Etudes d'Ent., XII, p. 6, pl. III, fig. 8.

There are eight specimens of the typical form of this species, in which the black spots of the secondaries at the base do not coalesce to form a large black band.

ACRÆA BUXTONI, Butler.

Acræa buxtoni, BUTLER, Ann. and Mag. Nat. Hist. (4), XVI, p. 395 (1875).

The collection contains six males and two females of this species.

ACRÆA ABBOTTII, Holland.

Acræa abbottii, HOLLAND, Ent. Supp., 1892, p. 89; Proc. U. S. Nat. Mus., XVIII, p. 233, pl. VII, fig. 1 (1896).

The collection contains six examples, only one of which is pale ochreous like the types from Kilimanjaro, the others being redder.

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The spots on the primaries on either side of vein 2 are variable, some of the specimens being provided with them as in the types, others having only one, and one example being altogether without them.

ACRÆA CABIRA, Hopffer.

Acræa cabira, HOPFFER, Monatsber. d. k. Preuss. Akad. d. Wiss., 1855, p. 640, n. 7; Pet. Reise n. Mossamb., Ins., p. 378, pl. XXIII, figs. 14, 15 (1862).

Two examples.

ACRÆA MIRABILIS, Butler.

Acræa mirabilis, BUTLER, Proc. Zool. Soc. Lond., 1885, p. 760, pl. XLVII, fig. 1.

There is one example of this beautiful insect.

ACRÆA AXINA, Westwood.

Acræa axina, WESTWOOD, App. Oates' Matabeleland, p. 344, pl. F, figs. 5, 6 (1881).

There is a series of twelve males and eleven females of a species, which I identify with some doubt as *A. axina*, Westwood. The females agree quite positively with the description given by Westwood and with the figure, and also with specimens identified as *A. axina* by Mr. Trimen, from Manica, taken by Mr. Selous and contained in my collection, but Mr. Westwood states that his figure is that of a male. The males before me are redder than in the figure given by Westwood, lack the striæ between the extremities of the nervures near the apex, and are quite translucent on the subapical tract. The females have the discal area of the primaries and the secondaries broadly whitish. The spots are throughout identical in location and form with those given in Westwood's figure. The specimens appear to me to be a local race of *A. axina*. I can not bring myself to regard it as a new species.

ACRÆA PUDORINA, Staudinger.

Acræa pudorina, STAUDINGER, Exot. Schmett., I, p. 84, II, pl. 33 (1888).

The collection contains a series of twenty-two males and six females of this beautiful species. The females are dark smoky brown and quite distinct in their ground color upon the upper side. Upon the under side they closely approximate the males. The spots are the same in size and location in the two sexes.

ACRÆA HOEHNELI, new species.

Male.—The primaries are translucent, with the apical extremity of the costa and the outer margin narrowly margined with black. The black border is widest at the extremity of the apex. The basal edge of the costa and the base and inner margin laved with dull red. Just within the black border of the outer margin between the nervules is situated a submarginal row of acuminate red, opaque spots. There is a moderately large black spot in the middle of the cell, two coalescing similar spots at the end of the cell and a series of four spots in a straight

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line beyond the cell. The latter series and the spot in the center of the cell are equidistant from the spots at the end of the cell. Three similar black spots situated on intervals 1, 2, and 3, form a curved series inwardly convex, just beyond the cell. The secondaries are opaque, light red deepening toward the base of the wing, bordered with deep black, upon which are indistinct traces of lighter markings between the extremities of the nervules. The spots of the under side appear faintly upon the upper side of this wing, the only spots which are distinct being the one at the end of the cell and five beyond it forming a zigzag series. The under side of the primaries is marked precisely as the upper side, except that the submarginal acuminate spots are pale ochraceous, and not red as upon the upper surface. The secondaries are pale yellowish ochraceous, marked with patches of flesh color. They are bordered with deep black, upon which a regular row of pale yellow lunules stands forth sharply defined against the black ground. The base and disk are spotted with numerous moderately large deep black spots, all sharply defined, and those nearest the base ringed about with narrow yellowish lines. The upper side of the thorax is black, with two bright yellow spots on its posterior margin. The upper side of the abdomen is black with a row of circular yellow spots on either side of the median line, increasing in size toward the anal extremity. Below these spots there is on either side a lateral yellow stripe. The under side of the abdomen is pale reddish marked with a double row of black lunulate markings, one on either side of the abdominal aspect of each segment. The lower side of the thorax is black spotted with red spots. The legs are margined with red and the lower sides of the palpi are red. The antennæ are black. Expanse, 60 mm.

Type.—No. 52, U.S.N.M.

This species is allied to *A. doubledayi*, Guenée, and *A. axina*, Westwood, but is abundantly distinct.

ACRÆA PHARSALOIDES, Holland.

Acræa pharsaloides, HOLLAND, Ent. Suppl., 1892, p. 89; Proc. U. S. Nat. Mus., XVIII, p. 232 (1896).

Male.—Does not differ to a marked extent from the female, except that the general ground color of the upper side of both wings is of a much brighter red than in the case of the female, and the transverse subapical bar of black spots is not as wide as in the female, and shows no tendency to coalesce with the spots at the end of the cell, as in the case of the female. The pale fuscous, transverse band situated in the apical region of the primaries of the female is replaced in the male by a band of the same form exactly, but of the prevalent red color of the rest of the wing. The specimen of the male before me is also noticeably smaller than the female from Kilimanjaro in the Abbott collection.

A male exactly like the one in this collection was purchased by me a

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number of years ago from Dr. Staudinger, who labeled it *A. pharsalia*. A search in the literature of the subject seems to make it clear that this is a manuscript name; at all events I have no clue to the publication of a species under this name. *A. pharsalus*, Ward, is a well-known species, totally distinct from the one under consideration, as appears from the male specimen before me. While there is a general resemblance between the females of the two species *A. pharsalus* and *A. pharsaloides*, the males differ greatly, as is seen upon comparison. In fact, had I possessed a male of the species at the time I published my original description, I do not think that I would have applied to this form the name which I gave it. The male of *pharsalus*, owing to the distribution of the red and black spots of the primaries, resembles the insects of the Egina group, while the male of *pharsaloides* more closely resembles *A. abdera* and its allies.

Male type.—No. 54, U.S.N.M.

There is a single example of the male of this species. The original type was a female.

ACRÆA PERENNA, Doubleday.

Acræa perenna, DOUBLEDAY, DOUBLEDAY and HEWITSON, Gen. Diurn. Lep., I, p. 141, pl. XIX, fig. 4 (1848).

There are two males not differing materially from specimens from the West Coast, though the red on the lower margin of the primaries is extended a little more broadly toward the base than in the examples in my collection from Sierra Leone and elsewhere.

Genus PLANEMA, Doubleday.

PLANEMA CHANLERI, new species.

The primaries upon the upper side are dark brown, interrupted by a reddish, ochraceous, submacular, discal band, composed of eight spots. Of these spots the five uppermost are narrow and elongated. The two upper spots are short, the three lower ones of the five are advanced inwardly forming a curved inward projection accommodated to the line of the discocellulars, and in serial order from the top of the row to the bottom extend outwardly more and more, at their outward extremities. Just below these spots and projecting still farther outwardly, but not extending as far inwardly, is an oblong quadrate spot. Below this, between veins 2 and 3, is the largest spot of the series, having its outer extremity quadrate, and its inner extremity defined by an oblique line running from about the middle of vein 2 obliquely upward to near the origin of vein 3. Below this on the first median interspace is a small triangular spot with its base parallel to the outer margin and its apex pointing toward the base of the wing. The secondaries are crossed on the middle by a broad, reddish, ochraceous band, with its inner margin approximately straight and its outer margin regularly curved and parallel to the outer margin. The outer margin is bordered by a broad dark brown band, the inner edge of which is regularly produced inwardly on the nervules and at the middle of each interspace. The basal area is rich maroon, profusely

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with black. The under side of both wings is marked precisely as the upper side, but the ground color is paler, and the black spots of the basal area of the secondaries in consequence stand forth more conspicuously. The palpi are black, edged with white upon the lower side. The thorax is black spotted with small yellow dots on the under side and having two similar spots on the posterior edge on the upper side. The upper side of the abdomen is black, the lower side light yellowish ochraceous, the yellow color extending upwardly as fine lateral lines on the posterior margins of the segments. In addition there are lateral rows of yellow circular spots on each side of the abdomen. The legs and attennæ are black.

The female is black with the spots and bands of the wings pure white. As is usual in this genus, the wings are broader and more rounded at the apex of the primaries than in the male sex and the body and wings are considerably larger. The macular band of the primaries differs in its outline from that of the male sex in having its outer margin somewhat more regular, and the inner extremities of the spots situated upon the median interspaces even, the spot on interval 2 not projecting inwardly farther than the spot on interval 3, as is the case in the male sex.

Expanse, male, 62 mm; female, 74 mm.

Types.—Nos. 53, 55, U.S.N.M.

Subfamily NYMPHALINÆ.

Genus ATELLA, Doubleday.

ATELLA PHALANTA, Drury.

Papilio phalanta, DRURY, Ill. Nat. Hist., I, pl. XXI, figs. 1, 2 (1770).

There are six examples of this common and widely distributed species.

ATELLA COLUMBINA, Cramer.

Papilio columbina, CRAMER, Pap. Exot., III, pl. 238, figs. A, B (1782).

There are three examples of this species, one badly damaged.

Genus PYRAMEIS, Hübner.

PYRAMEIS CARDUI, Linnæus.

Papilio cardui, LINNÆUS, Syst. Nat., I, 2, p. 774, n. 157 (1767).

Mr. Linell reports five examples of this species.

Genus JUNONIA, Hübner.

JUNONIA CEBRENE, Trimen.

Junonia œnone, HÜBNER, Sammlung Exot. Schmett., II, pl. 34, figs. 1, 2 (nec 3, 4), (1806).

Junonia cebrene, TRIMEN, Trans. Ent. Soc. Lond., 1870, p. 353; S. Afr. Butt., I, p. 210 (1887).

Junonia crebrene, BUTLER, Trans. Ent. Soc. Lond., 1870, p. 524.—GERSTAECKER, Gliederth.—Fauna des Sansibar-Gebietes, p. 369, n. 17 (1873).

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JUNONIA CLELIA, Cramer.[1]

Papilio clelia, CRAMER, Pap. Exot., I, pl. XXI, figs. E, F (1779).

Mr. Linell reports ten specimens of this species.

JUNONIA BOOPIS, Trimen.

Junonia boopis, TRIMEN, Trans. Ent. Soc. Lond., 1879, p. 331; S. Afr. Butt., I, p. 217, pl. IV, fig. 2 (1887).

Mr. Linell reports one example of this species.

Genus PRECIS, Hübner.

PRECIS CLOANTHA, Cramer.

Papilio cloantha, CRAMER, Pap. Exot., III, pl. CCCXXXVIII, figs. A, B (1782).

Mr. Linell reports four specimens.

PRECIS NATALICA, Felder.

Precis natalica, FELDER, Wien. Ent. Mon., IV, p. 106 (1860).—TRIMEN, S. Afr. Butt., I, p. 238 (1887).

Mr. Linell reports fourteen specimens.

PRECIS ELGIVA, Hewitson.

Junonia elgiva, HEWITSON, Exot. Butt., III, pl. XIII, fig. 1 (1864).—TRIMEN, S. Afr. Butt., I, p. 240 (1887).

Mr. Linell reports nine specimens.

PRECIS TUGELA, Trimen.

Precis tugela, TRIMEN, Trans. Ent. Soc. Lond., 1879, p. 334 (1887); S. Afr. Butt., I, p. 241, pl. IV, fig. 5 (1887).

The collection contains thirty-seven specimens of this species, only four of which were submitted to me for examination. There are two forms, one with the apex of the primaries very acute and falcate, as represented in the figure given by Mr. Trimen; the other with the apex likewise falcate, but the produced portion truncate at its extremity. I am inclined to think that we are dealing here with a case of seasonal dimorphism analogous to that which we observe in the case of *Junonia almana* and *Junonia asterie*, which are the dry and wet seasonal forms of the same insect. Aside from this difference in the outline and the somewhat more distinct development of the markings in the form with the acute apices of the primaries, I can see no difference sufficient to warrant more than a varietal separation. Being at present engaged in a revision of the African Nymphalidæ, I defer any further remarks upon this subject until I shall have had opportunity to more thoroughly go over the species of the genus *Precis*, of which I have enormous suites

[1] For full synonymy see Trimen, South African Butterflies, I, p. 214.

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from many portions of the continent, with accurate data attached as to the time of their appearance. Suffice it to say, that seasonal dimorphism apparently plays an important part in some of the species.

Genus SALAMIS, Boisduval.

SALAMIS ANACARDII, Linnæus.

Papilio anacardii, LINNÆUS, Mus. Lud. Ulr. Reg., p. 236, n. 55 (1764).

Mr. Linell reports fifty-four examples of this species.

SALAMIS NEBULOSA, Trimen.

Salamis nebulosa, TRIMEN, Trans. Ent. Soc. Lond., 1881, p. 441; S. Afr. Butt., I, p. 246, pl. IV, fig. 6 (1887).

There are twelve specimens of this species in the collection.

Genus EURYTELA, Boisduval.

EURYTELA HIARBAS, Drury.

Papilio hiarbas, DRURY, Ill. Nat. Hist., III, pl. XIV, figs. 1, 2 (1772).

Mr. Linell reports seven specimens.

EURYTELA DRYOPE, Cramer.

Papilio dryope, CRAMER, Pap. Exot., pl. LXXVIII, figs. E, F (1779).

Mr. Linell informs me that there are five specimens of this species in the collection.

EURYTELA OPHIONE, Cramer.

Papilio ophione, CRAMER, Pap. Exot., II, pl. CXIV, figs. E, F (1779).

There are twenty-three specimens of this species, according to Mr. Linell.

Genus HYPANIS, Boisduval.

HYPANIS ILITHYIA, Drury.

Papilio ilithyia, DRURY, Ill. Nat. Hist., II, pl. XVII, figs. 1, 2 (1773).

Mr. Linell reports thirty-four specimens of this insect.

Genus HYPOLIMNAS, Hübner.

HYPOLIMNAS MISIPPUS, Linnæus.

Papilio misippus, LINNÆUS, Mus. Lud. Ulr. Reg., p. 264, n. 83 (1764).

Mr. Linell reports three males and one female of this species.

HYPOLIMNAS WAHLBERGII, Wallengren.

Diadema wahlbergii, WALLENGREN, K. Sv. Vet. Akad. Handl., 1857; Lep. Rhop. Caffr., p. 27, n. 1.

There are two examples of this species in the collection.

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Genus NEPTIS, Fabricius.

NEPTIS AGATHA, Cramer.

Papilio agatha, CRAMER, Pap. Exot., IV., pl. CCCXXVII, figs. A, B (1782).

There is one typical example of this well-known form, and a second specimen which may be a mere variety, but may also represent an undescribed species. On the upper side it resembles *N. biafra*, Ward, on the under side it very closely approximates *N. agatha*. With only the one example I do not feel inclined to describe it as a new species, though more material at a later time may prove that this would be the proper course.

NEPTIS MARPESSA, Hopffer.

Neptis marpessa, HOPFFER, Monatsber. K. Akad. Wiss. Berl., 1855, p. 640, n. 8.—Peters' Reise n. Mossamb., Ins., p. 383, pl. XXIV, figs. 9, 10 (1862).

There are four specimens of this species.

Genus EUXANTHE, Hübner.

EUXANTHE WAKEFIELDII, Ward.

Godartia wakefieldii, WARD, Ent. Mon. Mag., X, p. 152 (1873).

Genus EUPHÆDRA, Hübner.

EUPHÆDRA NEOPHRON, Hopffer.

Romaleosoma neophron, HOPFFER, Monatsber. d. K. Akad. Wiss. Berl., 1855, p. 640.—Peters' Reise n. Mossamb., Ins., p. 386, pl. XXII, figs. 1, 2 (1862).

Mr. Linell determines seven specimens in the collection as belonging to this species.

Genus EURYPHENE, Boisduval.

EURYPHENE SENEGALENSIS, Herrich-Schaeffer.

Euryphene senegalensis, HERRICH-SCHAEFFER, Ex. Schmett., figs. 95–98 (1852–1856).

There are two males and three females, one of the latter in a very fragmentary condition, which seem to be more correctly referred to this species than to any other. The males are in nowise different from the insect figured by Herrich-Schaeffer, but the females more nearly resemble that sex of the well-known *E. cocalia* of the West Coast, save that the subapical transverse spots and bands are not white as in *E. cocalia*, but suffused with dull ochraceous. The insect seems to be a local race of *E. senegalensis*.

Genus HAMANUMIDA, Hübner.

HAMANUMIDA DÆDALUS, Fabricius.

Papilio dædalus, FABRICIUS, Syst. Ent., p. 482, n. 174 (1775).

Mr. Linell reports nine examples.

Genus PALLA, Hübner.

PALLA VARANES, Cramer.

Papilio varanes, CRAMER, Pap. Exot., II, pl. CLX, figs. D, E (1779).

One fairly good example.

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Genus CHARAXES, Ochsenheimer.

CHARAXES ZOOLINA, Westwood.

Nymphalis zoolina, WESTWOOD, Gen. Diurn. Lep., pl. LIII, fig. 1 (1850).

There are six males and two females of this species.

CHARAXES NEANTHES, Hewitson.

Nymphalis neanthes, HEWITSON, Exot. Butt., I, p. 88, pl. XLIV, figs. 2, 3 (1854).

There is one specimen of this species.

CHARAXES EUPALE, Drury.

Papilio eupale, DRURY, Ill. Exot. Ent , III, pl. VI, fig. 3 (1782).

One injured specimen.

CHARAXES SATURNUS, Butler.

Charaxes saturnus, BUTLER, Proc. Zool. Soc. Lond., 1865, p. 624, pl. XXXVI, fig. 1; Lep. Exot., p. 5, pl. II, fig. 2 (1869).—TRIMEN, S. Afr. Butt., I, p. 334 (1887).

One specimen.

CHARAXES BRUTUS, Cramer.

Papilio brutus, CRAMER, Pap. Exot., III, pl. CCXLI, figs. E, F (1782).

One specimen.

CHARAXES ETESIPPE, Godart.

Nymphalis etesippe, GODART, Enc. Meth., IX, p. 355, n. 19 (1823).

Four specimens.

CHARAXES CHANLERI, Holland.

Charaxes chanleri, HOLLAND, Proc. U. S. Nat. Mus., XVIII, p. 262 (1896).

The collection contains six males and three specimens of the hitherto undescribed female.

Female.—The upper side of the palpi is black. The upper side of the thorax and abdomen is dark fuscous. The lower side of the palpi and the pectus is white. The lower side of the thorax and abdomen is pale brownish gray. The legs are concolorous. The primaries are fuscous at the base and on the outer margin, the fuscous shade deepening into black toward the center of the wing and the outer angle. The wing is traversed from the costa before the apex by a band of discal spots, gradually increasing in size from the costa to the inner margin. The four uppermost of these spots are curved outwardly in a bent series; the four lower spots are oblong quadrate. All are ochre-yellow, except the two nearest the inner margin, which are washed with white. In addition to this series of spots there are two yellow spots beyond the end of the cell, and a smaller yellow spot at the lower outer angle of the cell. The secondaries are colored at the base as the primaries, with the inner margin dark fawn color. The macular band of the primaries is continued across the secondaries as a white band gradually diminishing in width toward the inner margin, and laved with blue on

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either side toward the anal extremity. The outer margin is broadly black beyond this discal band. The wing is bordered from vein 4 upwardly by light brown, and inferiorly toward the anal angle by glaucous green, produced upon the two tails projecting at the extremities of veins 2 and 4. These tails as well as the whole outer margin are edged by a very fine black line. Just within the light brown and greenish marginal border is a submarginal series of bluish white linear spots on the interspaces, bordered externally by black from vein 4 to the anal angle. Upon the under side the wings are marked as in the male, save that the broad macular discal band of the primaries and secondaries is reflected through from the upper side, and owing to the greater size of the wings in the female the spots and markings are more widely separated. Expanse, 65 to 70 mm

Type.—No. 56, U.S.N.M.

CHARAXES XIPHARES, Cramer.

Papilio xiphares, CRAMER, Pap. Exot., IV, pl. CCLXXVII, figs. A, B (1782).

One male specimen.

Family LYCÆNIDÆ, Stephens.

Genus TINGRA, Boisduval.

TINGRA MOMBASÆ, Smith and Kirby.

Tingra mombasæ, SMITH and KIRBY, Rhop. Exot., I, p. 31, Lycænidæ (African ., pl. VIII, fig. 11.

Mr. Linell reports ten specimens of this species.

Genus LACHNOCNEMA, Trimen.

LACHNOCNEMA BIBULUS, Fabricius.

Papilio bibulus, FABRICIUS, Ent. Syst., III, 1, p. 307, n. 163 (1793).

Two female specimens.

Genus CHILADES, Moore.

CHILADES MAHALLOKOÆNA, Wallengren.

Lycæna mahallokoæna, WALLENGREN, K. Sv. Vet.-Akad. Handl., 1857; Lep. Rhop. Caffr., p. 41, n. 16.

One male and one female.

Genus ZIZERA, Moore.

ZIZERA GAIKA, Trimen.

Lycæna gaika, TRIMEN, Trans. Ent. Soc. Lond., 3d series, I, p. 403 (1862).

One male and one female.

Genus CATOCHRYSOPS, Boisduval.

CATOCHRYSOPS OSIRIS, Hopffer.

Lycæna osiris, HOPFFER, Monatsber. d. K. Preuss. Akad. Wiss., 1855, p. 642, n. 21; Peters' Reise, n. Mossamb., Ins., p. 409, pl. XXVI, figs. 11, 12 (1862).

One female.

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CATOCHRYSOPS ASOPUS, Hopffer.

Lycæna asopus, HOPFFER. Monatsber. d. K. Preuss. Akad. Wiss., 1855, p. 642, n. 22.—Peters' Reise, n. Mossamb. Ins., p. 410, pl. XXVI, figs. 13–15 (1862).

Two females somewhat dwarfed.

Genus HYREUS, Hübner.

HYREUS LINGEUS, Cramer.

Papilio lingeus, CRAMER, Pap. Exot., IV, pl. 379, figs. F, G (1782).

One male.

Genus TARUCUS, Moore.

TARUCUS TELICANUS, Lang.

Papilio telicanus, LANG, Verz. Sein. Schmett., II, p. 47, n. 387–389 (1789).

Six female specimens are contained in the collection.

Genus CASTALIUS, Hübner.

CASTALIUS PERPULCHRA, Holland.

Lycæna perpulchra, HOLLAND, Ent. Suppl., Sept., 1892, p. 90; Proc. U. S. Nat. Mus., XVIII, p. 239, pl. VII, fig. 7 (1896).
Castalius hypoleucus, BUTLER, Proc. Zool. Soc. Lond., 1893, p. 660.
Lycæna exclusa, TRIMEN, Proc. Zool. Soc. Lond., 1894, p. 47, pl. VI, fig. 11.

One large female in a somewhat damaged condition.

Genus POLYOMMATUS, Latreille.

POLYOMMATUS BŒTICUS, Linnæus.

Papilio bœticus, LINNÆUS, Syst. Nat., Ed. XII, I, 2, p. 789, n. 226 (1767).

There are three males of this common and widely distributed species.

Genus DEUDORIX, Hewitson.

DEUDORIX ANTALUS, Hopffer.

Dipsas antalus, HOPFFER, Monatsber. d. K. Akad. Wiss. Berl., 1855, p. 641, n. 15.
Sithon antalus, HOPFFER, Peters' Reise n. Mossamb., Ins , p. 400, pl. XXV, figs. 7–9 (1862).

One specimen of this species.

Family PAPILIONIDÆ, Leach.

Subfamily PIERINÆ, Swainson.

Genus PONTIA, Fabricius.

PONTIA ALCESTA, Cramer.

Papilio alcesta, CRAMER, Pap. Exot., IV, pl. CCCLXXIX, fig. A (1782).

One specimen.

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Genus TERIAS, Swainson.

TERIAS ZOË, Hopffer.

Terias zoë, HOPFFER, Monatsber. d. K. Akad. Wiss. Berl., 1855, p. 640.—Peters' Reise n. Mossamb., Ins., p. 369, pl. XXIII, figs. 10, 11 (1862).

Two examples.

TERIAS ÆTHIOPICA, Trimen.

Terias æthiopica, TRIMEN, S. Afr. Butt., III, p. 21 (1889).

One example.

TERIAS BUTLERI, Trimen.

Terias butleri, TRIMEN, S. Afr. Butt., III, p. 23 (1889).

Two examples.

TERIAS REGULARIS, Butler.

Terias regularis, BUTLER, Ann. and Mag. Nat. Hist. (4), XVIII, p. 486 (1876).

Mr. Linell reports thirty-five specimens of this species.

TERIAS BISINUATA, Butler.

Terias bisinuata, BUTLER, Ann. and Mag. Nat. Hist. (4), XVIII, p. 485 (1876).

Two specimens.

TERIAS FLORICOLA, Boisduval.

Xanthidia floricola, BOISDUVAL, Faune Ent. Madgr., p. 21, n. 2 (1883).

There are two males of this species.

Genus MYLOTHRIS, Hübner.

MYLOTHRIS TRIMENIA, Butler.

Pieris trimenia, BUTLER, Cist. Ent., p. 13 (1869).[1]

Two females.

MYLOTHRIS, new species or variety. (?)

There is a female specimen of a *Mylothris* very closely allied to *M. berenice*, Hewitson, but differing in having the apical portions of the primaries much less broadly marked with black, and the spots at the ends of the nervules in the secondaries also much smaller in size, in fact reduced to mere points. The surface of the wing is also not nearly as dusky as in specimens of *Berenice* (females) from the West Coast. As the specimen is unique and in rather poor case, I do not feel justified in describing it as a new species, though I am inclined to designate it under the varietal name *Berenicides*. It apparently is an eastern local race of the well-known West African insect.

Type.—No.57, U.S.N.M.

Genus PIERIS, Schrank.

PIERIS THYSA, Hopffer.

Pieris thysa, HOPFFER, Monatsber. d. K. Akad. Wiss. Berl., 1855, p. 639, n. 1.—Peters' Reise n. Mossamb., Ins., p. 349, pl. XXI, figs. 7-10 (1862).

There is a single male of this species in the collection, and also a single female of the form in which the disk of the wings on the upper side is whitish.

[1] For full synonymy see Trimen, South African Butterflies, III, p. 33.

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PIERIS SPILLERI, Spiller.

Pieris spilleri, SPILLER, Ent., 1884, p. 62.—STAUDINGER, Ent. Nachr., 1884, p. 52.

There are five specimens a trifle larger than Natalian examples received from Mr. Spiller and contained in my collection.

PIERIS MESENTINA, Cramer.

Papilio mesentina, CRAMER, Pap. Exot., III, pl. CCLXX, figs. A, B (1782).

There are three males and two females.

PIERIS GIDICA, Godart.

Pieris gidica, GODART, Enc. Meth., IX, p. 131, n. 37 (1819).

There is one male specimen.

PIERIS SEVERINA, Cramer.

Papilio severina, CRAMER, Pap. Exot., IV, pl. CCCXXXVIII, figs. G, H (1782).

Two males and two females.

PIERIS SIMANA, Hopffer.

Pieris simana, HOPFFER, Monatsber. d. K. Akad. Wiss. Berl., 1855, p. 640, n. 13.—Peters' Reise n. Mossamb., Ins., p. 354, pl. XXIII, figs. 3–6 (1862).

There are three males and four females of this species, agreeing absolutely with both the description and the figures given by Hopffer. I can not fail to think that the insect spoken of and catalogued by Trimen as this species is not it. Mr. Trimen himself appears to be in doubt, and dwells upon the fact that in no Natalian examples is there any trace of the black discal spots on the under side of the primaries as represented by Hopffer. He says:

> The singular character which Hopffer gives of the presence in the male of the discal blackish spot between third and second median nervules on the under side of the fore wing is entirely wanting in the seven Natalian males before me. I feel doubtful whether this form should be considered more than a variety of *Charina*, Boisduval; hitherto I have seen no examples linking it to the specimens of *Charina* which are little irrorated on the under side.

The specimens taken by Lieutenant von Höhnel are manifestly *P. simana*, Hopffer, and upon comparison with specimens of *Charina*, Boisduval, received from Mr. Trimen, and contained in my collection, it is difficult to see how he could arrive at the conclusion he appears to have reached, unless he was dealing with some other form than true *simana*. There is no approximation between the two species except in a superficial manner.

PIERIS PIGEA, Boisduval.

Pieris pigea, BOISDUVAL, Sp. Gen. Lep., I, p. 523, n. 124 (1836).

There are seven males and four females of this species.

PIERIS MAHOBOIDES, new species.

Closely allied to *P. mahobo*, H. Grose Smith.[1] It differs from this species, the habitat of which is Madagascar, by the entire absence of

[1] Ann. and Mag. Nat. Hist. (6), VIII, p. 80; Rhop. Exot., Pl. Pinacopteryx I, figs. 1–3.

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the small black spot at the end of the cell on the under side of the primaries, and by the more restricted expanse of the apical black markings of the primaries.

Types.—No. 58, U.S.N.M.; two males, one very badly damaged, and a female.

PIERIS AGRIPPINIDES, new species.

Male.—Allied to *P. agrippina*, Felder, but distinct. The male resembles the female of *Agrippina*, as delineated in Mabille's Work on the Lepidoptera of Madagascar, contained in Grandidier's monumental work upon that island, but differs upon the upper side in lacking the black markings upon the upper side of the secondaries except the five situated at the ends of the nervules immediately upon the margin. The primaries on the under side are as the primaries on the under side of *P. agrippina*, female, but the secondaries are marked more as in *P. mesentina*. They are pale yellow, with the nervules marked with brown. On the upper side of the cell are two brown rays, running from before the base outwardly. The anterior margin is narrowly edged with brown. The outer margin is also defined with a narrow brown line, looping inwardly above vein 6, and interrupted at the middle of each of the interspaces. Within this line from vein 1 to vein 6 there are subtriangular whitish spots, paler than the rest of the wing, bounded internally by dark lines meeting on the middle of each interspace, and projected inwardly for a short distance as slender sagittate markings. A brown bar connects the costa and vein 7, and another broader similar bar connects veins 7 and 6 beyond the first bar. Below the cell on interval 1 there are two dark brown spots extending inwardly to the middle of the interval, where they terminate upon a fine black line, which runs from the base to nearly the outer margin. A similar brown spot is found on interval 2 near the origin of the first median nervule. Expanse, 64 mm.

Type.—No. 59, U.S.N.M.

This species is very different from *P. agrippina* and *P. mesentina*, though allied apparently to both. There are two males in the collection.

In addition to the foregoing species of Pierinæ the collection contains four specimens, all female, of Pierids, which I am unable to locate satisfactorily. One of these females may be the female of the variety of *P. thysa*, named *Sabrata* by Dr. Butler. In fact, I am almost positive of the identification. The other three, which resemble this in most respects, except that they do not have the under side of the wings so brilliantly colored, may be aberrant females of *P. pigea*, but it would be rash to assert this without more evidence than I possess. I refrain, therefore, from characterizing them or naming them.

Genus TERACOLUS, Swainson.

TERACOLUS HETÆRA, Gerstaecker.

Callosune hetæra, GERSTAECKER, Gliederth.-Fauna d. Sansibar-Gebietes, p. 365, pl. xv, fig. 2.

There are six males and three females of this species.

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TERACOLUS IONE, Godart.

Pieris ione, GODART, Enc. Meth., IX, p. 140, n. 74 (1819).

One female specimen.

TERACOLUS HELIOCAUSTUS, Butler.

Teracolus heliocaustus, BUTLER, Proc. Zool. Soc. Lond., 1885, p. 768, pl. XLVII, figs. 8, 9.

One male specimen.

TERACOLUS CALAIS, Cramer.

Papilio calais, CRAMER, Pap. Exot., I, pl. LIII, figs. C, D (1779).

One male.

TERACOLUS CASTALIS, Staudinger.

Idmais castalis, STAUDINGER, Exot. Schmett., I, p. 43, II, pl. 23 (1888).

Three males and two females.

TERACOLUS VENOSUS, Staudinger.

Idmais venosa, STAUDINGER, Exot. Schmett., I, p. 43, II, pl. 23 (1888).

There are five males which agree perfectly with the description given by Staudinger, which is rather better than his figure, which is not characteristic so far as the fine black lines on the disk of the primaries are concerned. In the figure it is not indicated that the white ground is marked by such lines, and the drawing simply indicates the neuration. In nature the neuration is not visible without the use of artificial means of determining it, except as it is indicated upon the disk by the fine deep black lines upon the median, the radial, and the lower costal nervules from the middle of the wings to the outer margin.

In addition to the five males, there are three females which I think are undoubtedly referable to this species. The female apparently was unknown to Staudinger, and I accordingly append the following description:

Female.—Body much as in the male, antennæ and feet likewise. The wings on the upper side are pure white, somewhat broadly powdered with blackish scales at their base. The primaries have a small oblong ocelliform spot at the end of the cell, followed by a curved band of four to seven maculæ running from the costa toward the inner margin across the disk parallel to the outer margin. The spots do not extend beyond vein 1 in the direction of the inner margin in any specimen before me, and in two cases do not pass beyond vein 2. The apex is marked with dark blackish gray clouding gradually diminishing in width from the costa toward the outer angle, which is not reached by these darker markings. This dark area is interrupted by a series of subtriangular, pale, creamy, white spots on the interspaces exactly on the margin. The extremity of each nervule is marked by a minute black dot. On the under side the markings of the upper side of the primaries faintly reappear, and in addition the apical area is faintly powdered with

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russety scales. The secondaries on this side are profusely irrorated with russety scales on the disk, forming faint nebulous cloudings. The expanse of the wings is the same as in the male sex.

Types.—No. 60, U.S.N.M.

TERACOLUS WALLENGRENII, Butler.

Teracolus wallengrenii, BUTLER, Proc. Zool. Soc. Lond., 1876, p. 157, n. 105.

Two males.

TERACOLUS METAGONE, new species.

Male.—Head black; antennæ black, margined with whitish on the under side; upper side of the thorax and abdomen black, the under side white; legs white. The primaries are pure white with the costa narrowly edged with deep black from the base to the middle of the wing, and then more broadly edged with black to the apex; the black border extends around the outer margin to the inner angle, just before reaching which it is greatly reduced in width, though not entirely vanishing. Within this border the apical third of the wing is broadly marked from just beyond the middle of the costa to the middle of vein 3 with bright clear orange yellow. The black of the outer margin is produced inwardly upon this orange tract on the ends of the nervules, and the black of the outer margin runs inwardly quite deeply upon vein 3 and less deeply upon vein 2. The apical orange tract is not defined inwardly by a transverse apical black bar. The inner margin is marked by a broad, pale, blackish longitudinal band, which extends from the base for about two-thirds of the length of the inner margin. The secondaries are white upon the upper side, with the base and the costal margin marked with a broad longitudinal band of the same color as that upon the inner edge of the primaries. The outer margin is marked by a series of triangular black spots at the ends of the nervules. These spots do not apparently tend to coalesce with each other. They are smallest toward the anal angle. There is a faint gray shade running from the inner margin above the anal angle outwardly to a point a little above the end of vein 3. The fringes of the secondaries are white, those of the primaries black, except at the apex and at the outer angle, where they are white, as on the secondaries. On the under side both wings are white, both have a minute dot at the end of the cell. The primaries are laved at the apex with pale lemon yellow, across the middle of the yellow tract having a broad transverse shade of clear orange.

Female.—The orange red apical tract of the primaries is more restricted than in the male, and the outer dark marginal border is not as dark as in that sex. Furthermore, the inner edge of the red tract is crossed from the costa to vein 3 by a very irregular curved band of dark spots, narrowest between the upper median and the radial nervules. The base of the primaries and the cell, as well as the portions of the wings below the cell about the origin of the median nervules, are broadly and evenly marked with pale blackish gray. This tract of

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dark color is defined outwardly by a line curving from before the middle of the costa to about the lower outer angle of the cell, then running outwardly, parallel to vein 4 for a short distance, then turning down at right angles to vein 2, then running obliquely inwardly to the inner margin, which it meets about one-third of its length from the base. On interval 1, about midway between the dark basal tract and the outer margin, is a broad spot of the same color, with its outer margin sharply defined at right angles to the inner margin and its inner margin obscure and ill defined. The secondaries are white with the base and the costal margin washed with pale gray. A blackish ray runs from the base along the upper margin of the cell, and the outer limit of the dark area is marked on the costa by a marked deepening of the dark shade. The outer margin is broadly suffused with pale gray like that at the base, more or less interrupted on the margin at the extremities of the intervals by paler spaces. On the under side the primaries are marked as in the male, except that the dark basal spots of the upper side reappear below, somewhat indistinctly except about the middle of the wing, where they are deep black and well defined. The markings of the upper side of the secondaries reappear upon the lower side, but much more faintly defined. The outer edges of both wings are faintly laved with yellowish like the apex of the primaries. Expanse, male 35 mm.; female 38 mm.

Types.—No. 61, 62, U.S.N.M.

The collection contains two males and one female of this species, which appears to be, so far as the male is concerned, somewhat closely allied to *T. antigone*, Boisduval, but may at once be distinguished from that species by the absence of the inner dark markings of the apical tract of the primaries in the male. The female is widely different.

TERACOLUS SUBVENOSUS, Butler.

Teracolus subvenosus, BUTLER, Ann. and Mag. Nat. Hist. (5), XII, p. 105 (1883).

There are four males of this species kindly determined for me by Dr. Butler of the British Museum, from a careful drawing, which I prepared and sent him. This is the insect which, in my paper upon the Lepidoptera collected by Dr. Abbott, and in my paper upon the first collection made by Mr. Chanler,[1] I designated as a doubtful variety of *T. gavisa*, Wallengren.

TERACOLUS CINCTUS, Butler. (?)

Teracolus cinctus, BUTLER, Ann. and Mag. Nat. Hist. (5), XII, p. 105 (1883).

There are three females in the collection, which I was inclined to believe to be the females of the preceding species, but Mr. Butler, after examining a drawing of them, says that he is inclined to think them to be the as yet undescribed females of the species named *T. cinctus* by him.

[1] Proc. U. S. Nat. Mus., XVIII.

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TERACOLUS PHLEGETONIA, Boisduval.

Anthocharis phlegetonia, BOISDUVAL, Sp. Gen. Lep., I, p. 576, n. 25 (1836).

One female example.

TERACOLUS EVAGORE, Klug.

Pontia evagore, KLUG, Symb. Phys., pl. VIII, figs. 5, 6 (1829).

One male example.

TERACOLUS JACKSONI, Sharpe.

Teracolus jacksoni, SHARPE, Ann. and Mag. Nat. Hist. (6), V, p. 336.—WATERHOUSE, Aids to Identif. Ins., pl. CLXXXIX (1890).

Five males and two females of this species.

TERACOLUS ACHINE, Cramer.

Papilio achine, CRAMER, Pap. Exot., IV, pl. CCCXXXVIII, figs. E, F (1782).

Three males and one female.

TERACOLUS PROTOMEDIA, Klug.

Pontia protomedia, KLUG, Symb. Phys., pl. VIII, figs. 13, 14 (1829).

One male and one female.

Genus ERONIA, Boisduval.

ERONIA LEDA, Boisduval.

Dryas leda, BOISDUVAL, App. Voy. Deleg. dans l'Afr. Austr., p. 588, n. 30 (1847).

Nine males and two females.

Genus CALLIDRYAS, Boisduval.

CALLIDRYAS FLORELLA, Fabricius.

Papilio florella, FABRICIUS, Syst. Ent., p. 479, n. 159 (1775).

Mr. Linell reports forty specimens of this species.

Subfamily PAPILIONINÆ, Swainson.

Genus PAPILIO, Linnæus.

PAPILIO POLICENES, Cramer.

Papilio policenes, CRAMER, Pap. Exot., I, pl. XXXVII, figs. A, B (1779).

One damaged specimen.

PAPILIO COLONNA, Ward.

Papilio colonna, WARD, Ent. Mon. Mag., X, p. 151 (1873).

Five specimens, three badly damaged.

PAPILIO LEONIDAS, Fabricius.

Papilio leonidas, FABRICIUS, Ent. Syst., III, 1, p. 35, n. 103 (1793).

Mr. Linell reports seven specimens.

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PAPILIO DEMOLEUS, Linnæus.

Papilio demoleus, LINNÆUS, Mus. Lud. Ulr. Reg., p. 214, n. 33 (1764).

Mr. Linell reports twelve of this species.

PAPILIO OPHIDICEPHALUS, Oberthür.

Papilio ophidicephalus, OBERTHÜR, Etudes d'Ent., III, p. 13 (1878).

There is one specimen of this species.

PAPILIO NIREUS, Linnæus.

Papilio nireus, LINNÆUS, Mus. Lud. Ulr. Reg., p. 217, n. 36 (1764).

Mr. Linell reports seven examples of this species.

PAPILIO ECHERIOIDES, Trimen.

Papilio echerioides, TRIMEN, Trans. Ent. Soc. Lond., 1868, p. 72, n. 2, pl. VI, figs. 1, 2.

There are twenty-one males and four females of this species, one of the females badly damaged.

Family HESPERIIDÆ, Westwood.

Genus SARANGESA, Moore.

SARANGESA MOTOZI, Wallengren.

Pterygospidea motozi, WALLENGREN, K. Sv. Vet.-Akad. Handl., 1857; Lep. Rhop. Caffr., p. 53.

One example.

Genus EAGRIS, Guenée.

EAGRIS ASTORIA, new species.

Male.—Antennæ black. Palpi black, margined below with yellow. Upper side of head, thorax, and abdomen dark brown. Lower side of thorax and abdomen ochreous gray. Legs concolorous. The primaries upon the upper side are vinous brown, slightly clouded with blackish at the base, and broadly clouded with blackish at the apex and the outer margin. The end of the cell is ornamented with two small light-colored translucent spots surrounded with black, the lower spot produced outwardly beyond the other. There are four small subapical white spots in the usual position. There is a discal series of four small translucent spots surrounded with blackish. Of these, two, the smallest, are located on interval 1 beyond the middle; the third in the ascending series, between the first and second median nervules, is the largest, and is subtriangular with its apex toward the costa; the fourth, between the second and third median nervules, is smaller, and transversely elongated. In addition, there are two small parallel dashes of black on interval 1, one-third of the distance from the base. The secondaries upon the upper side are of the same color as the primaries, slightly clouded with blackish at the outer angle, and marked with obscure

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macular bands of darker brown, parallel to the outer margin, one crossing the end of the cell, another on the disk and more distinct than the rest, and one submarginal. The fringes of both wings are concolorous, except near the anal angle of the secondaries, where they are lighter. On the under side both wings are bright buff yellow. The primaries have the apical third washed with pale brown, interrupted by an obscure submarginal series of lunate markings slightly darker than the ground color of the wings. There is a dark spot at the end of the cell, and the translucent spots are less well defined upon this side, not being surrounded by as dark brown margins as upon the upper side. The secondaries are touched with pale brown at the outer angle, and are ornamented with a curved series of distinct black submarginal spots, the one over the end of the cell on the costal area being the largest. The two nearest the anal angle are larger than the others, excepting the one last mentioned, and are triangular in form, with their apices pointing outwardly. Expanse, 36 mm.

Type.—No. 63, U.S.N.M., unique.

This species is wholly distinct from any other species in the genus known to me, coming nearest to *E. phyllophila* in the general appearance of the upper side, but widely different and wholly unlike that species on the under side.

Genus HESPERIA, Fabricius.

HESPERIA AGYLLA, Trimen.

Pyrgus agylla, TRIMEN, S. Afr. Butt., III, p. 286 (1889).

There is one example of this species.

Genus PADRAONA, Moore.

PADRAONA ZENO, Trimen.

Pamphila zeno, TRIMEN, Trans. Ent. Soc. Lond. (3), II, p. 179 (1864); S. Afr. Butt., III, p. 313, pl. XII, fig. 2 (1889).

There is one male example of this species.

Suborder HETEROCERA.

Family AGARISTIDÆ.

Genus XANTHOSPILOPTERYX, Wallengren.

XANTHOSPILOPTERYX SUPERBA, Butler.

Eusemia superba, BUTLER, Ann. and Mag. Nat. Hist. (4), XV, p. 141, pl. XIII, fig. 3 (1875).

One specimen.

XANTHOSPILOPTERYX FATIMA, Kirby.

Xanthospilopteryx fatima, KIRBY, Trans. Ent. Soc. Lond., 1891, p. 288, pl. XV, fig. 2.

Two examples.

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Family LITHOSIIDÆ.

Genus UTETHEISA, Hübner.

UTETHEISA PULCHELLA, Linnæus.

Tinea pulchella, LINNÆUS, Syst. Nat., I, p. 534, n. 238 (1758).

Two specimens.

Genus ARGINA, Hübner.

ARGINA AMANDA, Boisduval.

Euchelia amanda, BOISDUVAL, App. Voy. Deleg. dans l'Afr. Austr., II, p. 597, n. 133 (1847).

Six specimens.

Family HYPSIDÆ.

Genus ELIGMA, Hübner.

ELIGMA LÆTEPICTA, Oberthur.

Eligma lætepicta, OBERTHUR, Etudes d'Ent , XVII, p. 32, pl. I, fig. 6 (1893).

Eleven specimens.

Family NYCTEMERIDÆ.

Genus NYCTEMERA, Hübner.

NYCTEMERA LEUCONOE, Hopffer.

Nyctemera leuconoe, HOPFFER. Monatsber. d. K. Akad. Wiss. Berl., 1857, p. 422.—Peters' Reise n. Mossamb., Ins., p. 430 pl. XXVIII, fig. 3 (1862).

Five specimens.

Family LIPARIDÆ.

Genus RHANIDOPHORA, Wallengren.

RHANIDOPHORA PHEDONIA, Stoll.

Bombyx phedonia, STOLL, Cramer's Pap. Exot., IV, pl. CCCXLVII, fig. C (1782).
Isochroa eburneigutta, FELDER, Nov. Reise, Ins., pl. C, fig. 26.

One specimen.

Family LASIOCAMPIDÆ.

METAJANA, new genus.

Tongue obsolete. Palpi small, densely covered with hairs; terminal joint projecting downward. Front densely clothed with long appressed hairs projecting downward and overlapping the extremity of the palpi. Antennæ moderately long, bipectinate, the pectinations moderately long, both series compressed and projecting downwardly much as in the genus *Jana*. The tegulæ are moderately long, covering the insertion of the primaries and the secondaries. Abdomen robust, projecting beyond the anal angle of the secondaries for one-fourth of its length. The femora and tibiæ of all of the legs are densely covered with long hairs. The primaries have the costa nearly straight for three-fourths of their length from the base and slightly curved before the apex; the

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outer margin broadly convex, evenly scalloped between the extremities of the nervules; the inner margin straight from the outer angle to near the base, where it is sharply curved inwardly and upwardly; the cell short and narrow, its upper margin somewhat widely removed from the costa; veins 3 and 4 spring from the lower outer angle of the cell; veins 5, 6, and 7 spring from the upper outer angle of the cell; veins 7 and 8 spring from a common stalk arising before the upper outer angle of the cell; vein 12 is slightly curved beyond the base and anastomoses at its extremity on the costa with vein 11 and with vein 12*a*, which springs from the base and extends along the extreme outer baso-costal margin for about one-fourth of its distance from the base. In the secondaries the cell is open; vein 2 has its origin approximately equidistant between the base and vein 3; veins 3, 4, and 5 spring from a common point representing the lower outer angle of the cell; veins 6 and 7 spring from a common point representing the upper outer angle of the cell; vein 8 is stoutly curved at its inner extremity and anastomoses before its basal origin with the upper discocellular.

Type.—*M. chanleri*, Male, Holland.

METAJANA CHANLERI, new species.

Palpi, front, and collar dark reddish brown. Tegulæ and thorax gray, sprinkled with dark-brown scales. Upper side of abdomen pale reddish brown, becoming darker toward the anal extremity. The legs and the lower side of the abdomen and thorax are dark reddish brown. The antennæ are black. The primaries are grayish white, profusely sprinkled with dark-brown scales. An obscure dark-brown clouded line runs from the base outwardly through the cell and is slightly interrupted just beyond the extremity of the cell. This longitudinal band fuses with the obscure transverse band which runs from near the apex to the middle of the inner margin, its outer margin being exceedingly irregularly indented. Between the indentations are some obscure whitish sagittate markings, with their points toward the base. The secondaries are pale reddish on the inner margin, of the same color as the base of the abdomen. The costal and outer margins are of the same color as the primaries, obscurely and profusely mottled with dark brown and crossed by obscure curved submarginal and discal bands, and by a narrow median curved band, which is sharply defined on the costa, where it is black, and vaguely defined on the reddish inner area of the wing. On the under side both wings are pale reddish brown, profusely mottled, especially on the costal and outer areas, by small dark-brown scales, most numerous on the costa of the secondaries. Expanse, 100 mm.

Type.—No. 64, U.S.N.M., male.

Mr. Linell reports, in his note accompanying the sending of the specimens to me, two other specimens of this species reserved in the collection.

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Group NOCTUÆ.

Family OMMATOPHORIDÆ.

Genus CYLIGRAMMA, Boisduval.

CYLIGRAMMA LATONA, Cramer.

Phalæna latona, CRAMER, Pap. Exot., I, 20, pl. XIII, fig. B.

Mr. Linell reports three specimens of this species.

Family OPHIDERIDÆ.

Genus OPHIDERES, Boisduval.

Ophideres chalcogramma, WALKER, Cat. Lep. Het. Brit. Mus., XXXIII, p. 937 (1865).

Two specimens.

Family DYSGONIIDÆ.

Genus ACHÆA, Hübner.

ACHÆA Sp. (?).

A damaged example of a species unknown to me, and which I hesitate to describe as new, without better material.

In addition to these there are two specimens of geometers, which I can not now take the time to determine. Both are small and obscure.

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NOTES ON THE VAMPIRE BAT (DIPHYLLA ECAUDATA), WITH SPECIAL REFERENCE TO ITS RELATIONSHIPS WITH DESMODUS RUFUS.

By HARRISON ALLEN, M. D.

I HAVE had the privilege of studying two specimens of *Diphylla ecaudata*[1] belonging to the National Museum (No. $\frac{8440}{8970}$, from Sta. Efigenia, Tehuantepec, Mexico, and No. 6990, from Orizaba, Mexico), both collected by F. Sumichrast. The dried skins contained fragments of skulls in which the teeth were preserved. Upon a casual examination I was struck with the fact that the coloration was different from that given by Dobson in his catalogue of the Chiroptera of the British Museum, and that four incisors instead of two were present in the upper jaw. Since Dobson states that the muzzle and ears in *Diphylla* are as in *Desmodus*, and that the skull is very similar to that of *D. rufus*, I was not prepared to find marked contrasts when I came to compare *Diphylla* with that genus. I also noted that the original description of Spix gave an account in some respects more in harmony with the Mexican individuals than was Dobson's, and I received the impression that either the single specimen on which Dobson's account was based was not a specimen of *Diphylla*, or that the condition of the specimen did not permit of a critical comparison being made.

The text of Spix is herewith given, since the work in which it appeared[2] is rare and can not be readily consulted by the student.

DIPHYLLA, Spix.

Naso bifoliato; cauda et membrana interfemorali nullis. Descriptio: Corpus mediocre; caput breve, apice subobtusum; auriculæ oblongo-rotundatæ, perbreves, quasi truncatæ, basin versus omnino deficientes; tragus lanceolatus, integer, haud reconditus; vexilla duo supra nasum juxta seposita, quasi truncata, ad latera non prolongata perbrevia, præcipue posterius; dentes canini supra infraque duo, vix

[1] SPIX, Simiar. et Vespert. Brasil., p. 68, pl. XXXVI, fig. 7, 1823.—WAGNER, Schreb. Säugethier, Suppl. V, p. 615, 1855.—DOBSON, Cat. Chir. Brit. Mus., 1878, p. 550.—ALSTON, Biol. Centrali-Americana, 1879–1882, p. 1853, pl. III, fig. 6.

[2] Simiarum et Vespertilionum Brasiliensium Species Novæ, 1823–1863, p. 68, pl. XXXVI, fig. 7.

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exserti; incisivi supra infraque quatuor, superiores medii lateralibus postpositi, maiores, apice sexdentati, semicirculariter collocati, largi, caninis contigui; molares supra infraque octo, breves apice crenulati, inferiores a caninis distantes, lingua subverrucosa, apice nonnihil lata et obtusa; labia non verrucosa, fere uti in Molosso pilosa; membrana alaris augustata, lumbis aduata, versus apicem digitorum valde elongata, tenuis, recurva, versus tibiæ basin excavato-decurrens; pollex manus solummodo unguiculatus, cum radio et digito indice membrana vix ulla conjunctus; pedes posteriores radium brachii fere æquantes, membrana interfemoralis deficiente omnino liberi; planta pedis longior; digiti pedis posterioris omnes unguiculati; calcaneus extus vix conspicuus; cauda nulla.

DIPHYLLA ECAUDATA.

Corpore villoso-piloso; dorso fusco-brunneo; capite et abdomine subtus brunneo-canescentibus; alis nigricantibus, nudiusculis; facie versus aures villoso-pilosa, nudiuscula; cauda et membrana interfemorali nullis; calcaneo extus vix conspicuo.

Longitudo trunci a nasi apice usque ad caudæ initium 3″, capitis ¾″, humeri ¾″, radii 1¾″, pollicis 5‴, digiti indicis 1″ 4‴, medii 2¾″, minimi 2″ 1‴, femoris ¾″, tibiæ 7‴, plantæ 8‴, auricularum 3‴, tragi ¾‴; latitudo occipitis ultra ¼″, auricularum 4½‴, interscapulas 1½″, alarum extensarum 10½″.

There is a slight lack of harmony between the figure and the description. The calcaneum is said to be present (vix conspicuus), while it is not visible at all in the figure.[1]

The molars are erroneously given, since four are counted on each side of both upper and lower jaws. One fails to understand how the exceedingly minute lateral incisor was detected when the larger teeth making up the premolar and molar series were miscounted.

The coloration given by Dobson—"above, reddish brown; below, yellowish white"—is unlike that of the National Museum specimens. The language of Spix, however, agrees so far as I translate the phrases "dorsus fuscus-brunneo, subtus brunneo-canescentibus" (back, clear brown to obscure brown; below, obscure brown gray and white)—as we would say, "hoary brown".

It is difficult to account, except on the ground that this specimen was immature, for the description of Wagner. According to this writer, *Diphylla* possesses six incisors in the upper jaw, only two molars (premolars and molars?) in the upper and three in the lower jaw. The interfemoral membrane is absent. Above, the hair is red brown and unicolored; below, of a dirty yellowish white, the hairs being brown at their bases. The account would be quite unrecognizable were the characteristic pectination of the lower incisors not given, a peculiarity, indeed, which creates for the species the name of "Der Kammzahn."

E. R. Alston states that *Diphylla* is distinguished from *Desmodus*

[1] Spix's name *Diphylla* is defined in the first words of his description "naso bifoliata." The nose may be said to be bifoliate in *Diphylla, Desmodus, Brachyphylla, Mormops, Chilonycteris* and *Natalus*. The posterior "leaf" appears to be a glandular mass, the sides of which are constant in all the Phyllostomidæ. In the usual forms (naso monofoliata) the lance-shaped appendage to the muzzle appears to take the place of the posterior "leaf."

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by possessing a shorter calcaneum;[1] by the breadth of the lower incisors; by the fur being reddish-brown above and yellowish white beneath. The figure he presents is a copy of the specimen in the Berlin Museum, and is based on an original drawing made under the supervision of Peters. The specimen would appear to have been a dried skin. The tragus is not erect, but deflected in a manner not described by any writer. The chinplate is very large. The muzzle is concave both at the sides and at the upper margin. The transverse ridge across the face vertex is as thick in the center as at the sides, thus differing from Dobson's description. The auricle is hairy on the interior.

The standard for comparison accepted by Dobson is a correct one. There is no form with which *Diphylla* can be compared so profitably as *Desmodus*. On page 775 I have grouped a number of cranial characters which the genera have in common. To these many others in the skeleton and the superficial parts may be added, a partial list of which is here given:

Plan of elbow joint the same, viz., a simple middle convexity playing on two external flanges; epitrochlea transverse, massive. A calcaneum (without calcar) constituting the projection at ankle for the attachment of the interfemoral membrane; a lower lip more or less cleft in the middle line;[2] absence of the tail; the small size of the second interdigital space; the greatly shortened face axis, and teeth specialized for cutting and piercing.

I have thought it desirable to revise the description of *Diphylla* by the aid of the two dried specimens already noted. The following is an account of the fur: The tips of the hair covering the back and sides of the neck, of a dark fawn, the shafts nearly white. The effect on the eye is of the mingling of the white and dark fawn colors. It is distinct from that of the hair over the back, where the tips are dark brown, and, while the shafts are white, they are not seen, owing to the adpressed arrangement of the hair. Toward the rump the hair is more woolly. The arm and forearm are closely furred almost to the wrist. A fine growth of hair covers the thumb. The thigh, leg and foot are also hairy, but the fur is here woolly and sparse. The skin to the outer side of the leg, the hem and margin of the endopatagium (wing membrane from body and posterior extremity to the fifth digit) is hairy.

The prevalent color of the under surface of the body is gray. The white color on the hair is confined to the base. The wing membranes are covered, by a broad triangular field of gray hair, whose base is at the side of the body and whose apex reaches to within an inch of the

[1] In three specimens of *Desmodus* studied, the calcaneum was found shorter than in *Diphylla*. Indeed, in *Desmodus* the calcaneum is a mere tubercle, scarcely measurable, while in *Diphylla* it constitutes a rod 4 millimeters long.

[2] This assertion is made advisedly, notwithstanding the statement of Dobson that the lower lip is "not grooved," and the figure of Peters (vide Alston) in which a very large individual truncate labial plate is seen. Unfortunately the plate is not represented as divided in figure 1.

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wrist. The anterior surfaces of the inferior extremities are covered with woolly gray hair as far as the ankles.

The face is nearly naked, but a conspicuous pencil of hair occupies the space between the eye and the nose leaf.

The description of the fur by Dobson is as follows: "Fur above, reddish brown; beneath, yellowish white, darker at the base of the hairs." The inadequateness of this description when compared with the above account is evident. In the National Museum specimens, the base of the hair is everywhere white, and the hair of the crown and back of the neck is for the greater part of its length pure white. The shades of brown are nowhere to be interpreted as reddish brown.

The general scheme of fur distribution is of interest. As a whole, the genus is more hirsute than *Desmodus*. The hairiness of the thumb and back of the foot, and the extension of hair on the endopatagium, are unusual characters. The appropriation of hair by the wing membrane to the outer side of the leg is also unusual. In *Artibeus* I have noted how the skin in the region of the fibular side of the leg is differentiated from the rest of the wing membrane. In *Diphylla* this tendency is carried to a yet higher degree—the region named being covered with hair. The separation of the fur of head and neck from that of the trunk is as conspicuous in *Diphylla* as elsewhere in the order. The great length and richness of the fur on the side of the neck (extending as far as the shoulder) is remarkable.

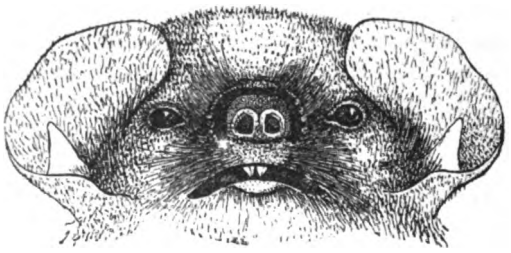

Fig. 1.
DIPHYLLA ECAUDATA.
Front view of face and head. Twice natural size.

The muzzle is flat and square, without excavations or incisions on the upper border, and is not separated inferiorly from the lip. Continuous with the lower outer angle is a ridge leading to the great crescentic gland-mass, constituting a coarsely setose ridge. The space directly back of the muzzle is occupied in one specimen (No. 6990, U. S. N. M.) by slight extension from the right side of the gland-mass. The left side is without such occupation. In the other specimen (No. 9440, U. S. N. M.) the space is filled with a minute elevated mass of glands, which extends across and unites the two great crescentic gland-masses. Dobson states that "a raised (?) glandular ridge forms a semicircle between and behind the eyes, somewhat broader on the sides, but not thickened in the center." This "center" answers to the transverse ridge back of the muzzle in specimen No. 9440, U. S. N. M., and which is seen to be imperfect in No. 6990, U. S. N. M. Alston figures the head with this transverse crest well developed.

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The lower lip, as already mentioned, does not present a square-sided naked surface but is indistinctly cleft. See figure in Alston's account.[1]

Auricle subrounded, entire, with obscurely developed, internal basal and external basal lobes. Tragus erect, broad, naked, abruptly acuminate, thickened on surface near apex. The outer border not spinose or crenulate; external basal lobe small, external basal notch shallow.

The membranes do not present any noteworthy features. The radius exhibits a humeral trochlea which is much deeper than in *Desmodus*. The ulna ends at the distal end of the middle third of the radius by anchylosis with that bone, but no flange extends its line toward the wrist as is the case with *Desmodus*. The radius is articulate with the humerus by a surface which is concave in the middle and convex on the borders. The distal end of the humerus exhibits anteriorly a rounded convexity in the middle and concave borders; the epicondyle is of great size (equal to two-thirds of the articular surface), and projects horizontally.

The interfemoral membrane is rudimental and is confined to a mere hem on the inside of the thigh and leg. In *Desmodus* the membrane extends across the interfemoral space as an apron, 12 mm. wide. These contrasts lead me to conclude that the two genera exhibit peculiarities in wing movements which correlate with wing characters, but the material at hand is insufficient to establish them. The following contrasts with *Desmodus* are tabulated:

COMPARISON OF THE CHARACTERS OF DIPHYLLA AND DESMODUS.

Diphylla.	*Desmodus.*
Humeral trochlea deep.	Humeral trochlea shallow.
Radius without ridge distal to ulna.	Radius with ridge distal to ulna.
Prebrachium membrane extends to wrist.	Prebrachium membrane extends to middle of radius.
Interfemoral membrane confined to inferior extremities as a hem.	Interfemoral membrane crosses space between inferior extremities.
Gland-masses at sides of muzzle scarcely meet across face-vertex or not at all.	Gland-masses at sides of muzzle meet across face-vertex in a high subconical skin fold.
Tragus naked.	Tragus hairy.
One-third length of thumb occupied by the metacarpal bone, whose base does not retain a conical callosity.	One-half the length of thumb occupied by the metacarpal bone, whose base retains a conical callosity.

Dental formula.—$i\frac{4}{4}\ c\frac{1}{1}\ p\frac{2}{3}\ m\frac{1}{1} \times 2 = 34.$

Upper teeth.—The enormous central incisors larger than the canines. They are trenchant, opposed for the one-third their length, the lanceolate points being distinct. The posterior concave surfaces are almost contiguous to the canines. The very minute nodular lateral incisors lie to the inside of the canines. The premolars compressed with knife-like edges, obscurely pointed—the first with a simple, the second with

[1] Biol. Centrali-Americana, 1879–1882, p. 53, pl. III, fig. 6.

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a wavy contour suggesting the presence of a trilobed cutting edge. The single molar is a minute conoid nodule.

Lower teeth.—The incisors large, pectinate, the central twice the size of the lateral. The centrals are apparently with scarcely any alveolæ, being seen in their entire length in the pit back of the mentum,

Fig. 2.

SKULLS OF DIPHYLLA AND DESMODUS.

Anterior portion of skull of (*a*) *Diphylla ecaudata* and (*b*) *Desmodus rufus*; viewed from above. More than twice natural size.

while but little of the socket-wall is visible from in front. The canines exhibit small heels, which give at first sight the impression that an interval exists between the canines and the first premolars, but close inspection shows that the teeth are contiguous. The premolars compressed laterally with sharp knife-like edges; first premolar twice the

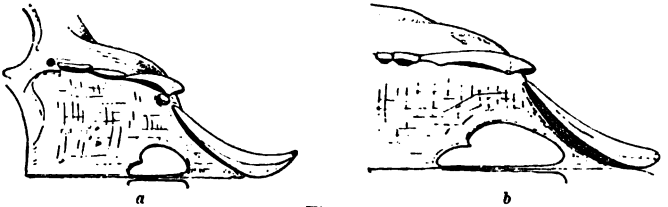

Fig. 3.

PALATES OF DIPHYLLA AND DESMODUS.

Hard palate and teeth of upper jaw of (*a*) *Diphylla ecaudata* and (*b*) *Desmodus rufus*; viewed from below. Five times natural size.

size of the second, and the third more than twice the size of the first. Thus the four teeth are alternated in size, the first being larger than the second, the third larger than the fourth. The third premolar is obscurely trilobed; the others are simple.

Palatal rugæ six.

Fig. 4.

LOWER JAWS OF DIPHYLLA AND DESMODUS.

Horizontal ramus of lower jaw and teeth of (*a*) *Diphylla ecaudata* and (*b*) *Desmodus rufus*; viewed from above. Six times natural size.

Skull.—Neither of the skulls of the specimens examined were complete; one, indeed, was in fragments. The following notes have been made in comparison with the skull of *Desmodus*. It will be seen that the statement of Dobson that the skull of *Diphylla* resembles *Desmodus* is not sustained.

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COMPARISON OF THE CHARACTERS OF THE SKULLS OF DIPHYLLA AND DESMODUS.

Diphylla.	*Desmodus.*
Anterior nasal aperture as high as wide.	Anterior nasal aperture higher than wide.
Distance between anterior ends of the pretemporal crests equal to length of the convex face-vertex.	Distance between anterior ends of the pretemporal crests greater than that of the length of the concave face-vertex.
Nasal bones marked at the side by a vessel groove.	Nasal bones without groove, but with four foramina at naso-frontal suture.
The pretemporal crests do not unite to form sagitta.	The pretemporal crests unite to form a small sagitta.
The incisive foramina one-fourth the length of the flat hard palate, which is scarcely narrowed posteriorly.	The incisive foramina over one-third the length of the acutely vaulted hard palate, which is narrowed posteriorly.
The skull subrounded.	The skull subpyramidal.
The margin of the palate bone beyond hard palate with spine.	The margin of the palate bone beyond hard palate without spine.
The fronto-maxillary inflation conspicuous, the entire orbital margin swollen.	The fronto-maxillary inflation inconspicuous.
The infraorbital canal simple and opening on the face immediately at orbital rim.	The infraorbital canal double and opening a distance beyond the orbital rim in a depression caused by a thickening of the alveolar border.
The zygoma narrow, scarcely high in middle; arch well sprung from the side of the head.	The zygoma wide, conspicuously high at the middle; arch scarcely at all sprung from the head.
Coronoid process greatly inclined backward, much higher than condyloid process.	Coronoid process almost vertical, almost on level with condyloid process.
Length of sigmoid notch scarcely exceeding distance from condyloid process to the angle.	Length of sigmoid notch twice the distance between the condyloid process and the angle.
Masseteric impression on lower jaw extends to the free margin of the mandible.	Masseteric impression does not reach the lower margin of the mandible.
The symphysal suture of the lower jaw closed.	Symphysal suture of lower jaw open.
Within cranium, ethmoid region and body of sphenoid flat.	Within cranium, ethmoid region and body of sphenoid greatly elevated.
Inner wall of orbit uniformly concave.	Inner wall of orbit convex over region of ethmoid bone.

The face axis in the two forms being of the same length, and the ethmoid being wider and deeper in *Desmodus*, while the nasals and naso-maxillary inflations are larger in *Diphylla*, gives the impression that the uses of the nasal chambers must differ in the two forms.

Measurements of skulls of Diphylla and Desmodus.

Measurements.	*Diphylla* No. 6990, U. S. N. M.	*Desmodus* No. 13202, U. S. N. M.
	mm.	*mm.*
Greatest length	23	.....
Greatest width	11	12
Least width	8	6
Length of face from orbit	3	4
Length of nasal bones	4	3
Length of palate	6	9
Width of mesopterygoid fossa posteriorly	4	3
Length of lower jaw	14	15
Distance from tip of coronoid to the basal line of ramus	4	7
Intergonial distance	10	9

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After this rather striking contrast, it is of interest to note the following points which the two genera possess in common, showing a close alliance between them.

Interval between the maxillary canines occupied by the enormous central incisors. Length of central incisors equal to height of anterior nasal aperture. Pterygoid process produced posteriorly in a sharp

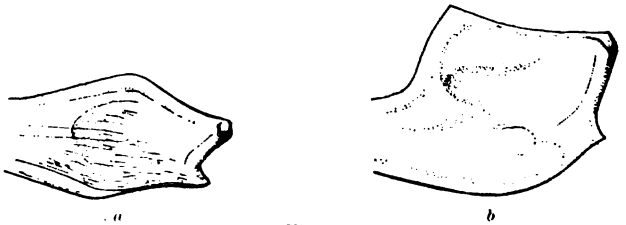

Fig. 5.

LOWER JAW OF DIPHYLLA AND DESMODUS.

Ascending ramus of lower jaw of (*a*) *Diphylla ecaudata* and (*b*) *Desmodus rufus*; viewed from side. Four times natural size.

spine. Tympanic bones inflated, large, nearly of same size, firmly anchylosed to the temporal bone; the opening for membrane small. Mesopterygoid fossa narrowed anteriorly and progressively widened posteriorly. Ascending ramus of the lower jaw high, with shallow sigmoid notch and rudimental angular process. The lower jaw back of

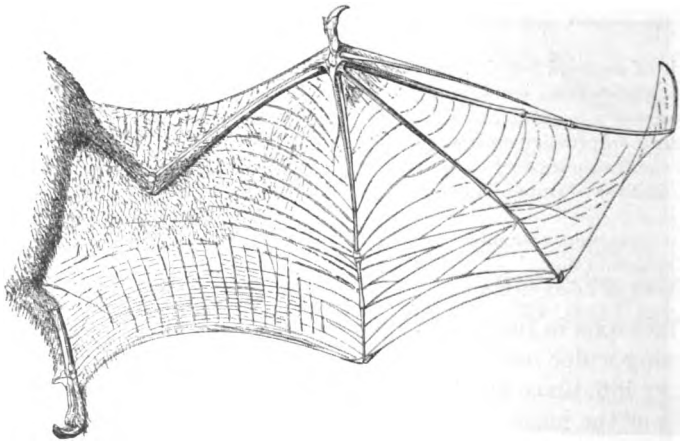

Fig. 6.

WING MEMBRANE OF DIPHYLLA ECAUDATA.

Anterior view. One-half natural size.

mentum provided with deep pit in which during articulation the maxillary central incisors are received. All teeth sectorial; lower incisors and canines pass well in front of upper incisors in closure of jaws.

Diphylla is more generalized than *Desmodus*. The face axis is longer, the nasal chambers more ample, the maxillary incisors and canines weaker, while the teeth are less reduced in number.

Diphylla is, on the whole, a less specially adapted form than *Desmodus*. The proportion of first metacarpal bone and phalanges are as is the

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order, while in *Desmodus* the metacarpal is nearly as long as the phalanges and furnished with a tactile pad at base; a similar but smaller pad is seen on the foot. The teeth in *Diphylla* are more numerous than in *Desmodus*, but are less powerful. The projection of the lower jaw beyond the upper is less marked in *Diphylla*. The claws, on the other hand, are more curved and prehensile than in that genus. It is correct to assume that in *Diphylla* the thumb and foot are employed in a manner like the rest of the order, but that in *Desmodus* the use to which the parts are put is distinctive; and further, that *Diphylla*, while known to take blood from animals, can make but a weak attack as compared to *Desmodus*. This is due not only to the smaller teeth, but to the lower jaw being less protruding and the animal not being able to breathe therefore so freely when feeding as is the case with *Desmodus*.

In the phyllum of the Chiroptera, *Diphylla* and *Desmodus* are on a branch of the Stenodermata, *Diphylla* being near the base of the branch, while *Desmodus* arises from near the free end.

While these pages were going through the press, I wrote to Dr. Paul Matschie of the Konigliche Museum für Naturkunde, Berlin, requesting that he examine the specimen of *Diphylla* in that institution, especially as to the number of the upper incisors. He courteously responded, and I am glad to reaffirm the accuracy of the description and enumeration as given by Dobson. Under all the circumstances *Diphylla* is correctly described by Spix (with the exception of the number of the molars), and therefore the Berlin form is either anomalous as to the number of the upper incisors or is a type of a separate genus. It is most likely the former. I have in my possession a specimen of *Chilonycteris macleayi* which has but two incisors in the upper jaw. If, however, comparisons should not sustain this reference, the name *Hæmatonycteris* may be assigned the form described by Dobson.

Dimensions of two specimens of Diphylla ecaudata.

Measurements.	Cat. No. U. S. N. M. 6900.	Cat. No. U.S.N.M. 9440.
Length of head	18	18
Head and body (from crown of head to base of tail)	75	75
Length of forearm	55	50
First digit:		
Length of first metacarpal bone	4	4
Length of phalanges	9	9
Second digit:		
Length of second metacarpal bone	45	45
Length of first phalanx	7	6
Third digit:		
Length of third metacarpal bone	51	50
Length of first phalanx	11	12
Length of second phalanx	29	25
Length of third phalanx	15	18
Fourth digit:		
Length of fourth metacarpal bone	51	50
Length of first phalanx	10	10
Length of second phalanx	22	20
Fifth digit:		
Length of fifth metacarpal bone	51	50
Length of first phalanx	12	13
Length of second phalanx	17	15
Height of ear	13	.....
Height of tragus	5	.....
Length of thigh	15	15
Length of tibia	20	20
Length of foot	14	15

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DESCRIPTION OF A NEW SPECIES OF BAT OF THE GENUS GLOSSOPHAGA.

By HARRISON ALLEN, M. D.

IT IS a remarkable circumstance that the genus *Glossophaga*, while the most common of any of the forms embraced in the group of Glossophagæ, and has been collected from the widest range of any of i's race, should have presented degrees of variations so low as never to have permitted the recognition of more than a single species. The complicated synonymy successfully unraveled by Peters, it is true, contains a number of names of species, but these were proposed through misapprehension of assumed generic values and bear no relation to questions of specific distinction.

A careful study of two specimens (Nos. 9522 and 9523) belonging to the United States National Museum has convinced me of the necessity of recognizing two species of *Glossophaga*—namely, *Glossophaga soricina* and the one I now describe.

GLOSSOPHAGA VILLOSA, new species.

Auricle entire on outer border or slightly emarginate. Internal basal lobe bound down to head without trace of ridge. Excepting in length of head and trunk everywhere smaller than *G. soricina*. The ascending process of the zygoma twice the size of the same part in that species. Wing membrane from distal fourth of tibia. The terminal cartilage of the fourth digit terete.

The auricle is without ridge at base of the internal basal lobe, which is scarcely defined and closely bound down to head; outer margin almost entire; external basal lobe and nodule inconspicuous. Tragus with trace of serration on outer margin, basal lobe large, quadrate.

The nose-leaf hairy, without midrib at internarial pedicle, projecting scarcely at all above the simple gland mass of the upper lip, which it almost entirely occupies. Thumb one-fourth the length of the forearm—namely, nine to thirty-two. The tail had evidently occupied a position similar to that seen in *G. soricina*. It had been removed in preparing the skin.

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Based on skins of two adults: No. 9523, U.S.N.M., La Guayra, Venezuela;[1] and No. 9522, U.S.N.M., co-types.

No. 9523, U.S.N.M., fur soft, shrew-like; dull ash at basal two-thirds, sooty at apical third; it extends along the entire length of the dorsi-facial region. No. 9522, U.S.N.M., quite the same, but is dark brown instead of sooty.

The skull[2] closely resembles that of *G. soricina*, but is smaller and thinner walled. The ascending process of the zygoma is longer and more pointed than in the species just named; the palatal notch is less acute. The fronto-maxillary inflation is conspicuous. The symphysis menti is carinate. The angle of the lower jaw projects backward slightly beyond the line of the condyloid process. The brain case is 12 mm. and the face 7 mm. long.

The upper central incisors broad with slightly concave cutting edges; the lateral incisors are narrow with oblique cutting edges. The premolars are slightly separated from one another and the second premolar from the first molar; they are compressed, subequal, and triangular; the second premolar is thickened posteriorly. The other teeth closely resemble those of *G. soricina*. The first upper molar is longer than the second and the second longer than the third; there are no ridges extending from the paracone to the metacone. The third upper molar does not overlap the second molar at the buccal border.

The muscle fascicles and nerve markings of the endopatagium disposed as in *G. soricina*. This system is the weakest of any of the group of the Glossophagæ. The terminal cartilages are throughout terete.

On the whole the descriptions of Pallas and of Geoffroy agree well with *Glossophaga soricina* of Peters' revision, and exclude those specimens here embraced under *G. villosa*. In Geoffroy's figure[3] the measurements of the nose-leaf agree with those of *G. soricina*, but the shape of the tragus and internal basal lobe of the auricle are like those of the form under consideration. But the figure is evidently based upon a dried specimen.

The isolation of the premolars in *G. villosa* answer fairly well to the arrangement of the teeth in an old example of *G. soricina*. This is an interesting fact, inasmuch as it suggests that senile characters in one species may be the same as those found in young adult life of another.

The following proportions are noteworthy: The first phalanx of the third digit is longer than the second. The third metacarpal bone is as long as the forearm. The forearm is 1.15 mm., the smallest in the group. The calcar is one-third the length of the tibia. The first phalanx of the first toe extends slightly beyond the first phalangeal joint

[1] It is not certain that the locality here given is the correct one. The record in the National Museum catalogue is imperfect.

[2] In addition to the skull in the type specimens, I possess a skull from Brazil presented by the late Mr. Harte, which answers to the above description.

[3] Ann. du Mus., 1810, XV., pl. XI.

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of the second toe. The first row of phalanges decreases progressively from the second to the fifth toe.

Type.—No. 9522, U.S.N.M.[1]

Measurements of Glossophaga villosa.

	Millimeters.
Head and body (from crown of head to base of tail)	45
Head and forearm	32
First digit:	
Length of first metacarpal bone	4
Length of first phalanx	4
Second digit:	
Length of second metacarpal bone	25
Length of first phalanx	2
Third digit:	
Length of third metacarpal bone	30
Length of first phalanx	11
Length of second phalanx	14
Length of third phalanx	6
Fourth digit:	
Length of fourth metacarpal bone	27
Length of first phalanx	9
Length of second phalanx	9
Fifth digit:	
Length of fifth metacarpal bone	27
Length of first phalanx	8
Length of second phalanx	8
Length of head	21
Height of ear	11
Height of tragus	3
Length of tibia	11
Length of foot	8
Length of interfemoral membrane	9

The measurements of No. 9523, U.S.N.M., are the same as in No. 9522, U.S.N.M., excepting in the second phalanx of the third manal digit, which is but 12 mm. long.

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